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NORTHERN MARKETING AND NUTRITION

RESEARCH DIVISION

PUBLICATIONS AND PATENTS

July-December 1971

**Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE**

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Northern Marketing and Nutrition Research Division
Agricultural Research Service
United States Department of Agriculture
1815 North University
Peoria, Ill. 61604

REQUEST FOR INFORMATION

The results of the research of the Northern Marketing and Nutrition Research Division are published regularly in the technical literature, and public-service patents are secured to cover patentable inventions and discoveries (see page 63). As a convenient guide to our publications and patents, a list with abstracts is published semiannually. The abstracts describe the current research and indicate the progress achieved. Further information on any of the developments, as well as earlier technical papers, may be obtained by writing us.

In conformance with the policy of the Department of Agriculture, Northern Division publications are available to scientists and other specialists, librarians, representatives of the press, and others interested.

Reference to commercial equipment or proprietary products is made as part of the exact experimental conditions. Naming a company or product does not imply approval or

recommendation by the U.S. Department of Agriculture over others not mentioned.

Requests for specific reprints should be by number and addressed to the Northern Division. Those titles marked with an asterisk [*] are not available for distribution.

Most of the publications are in journals that are available in libraries. Photographic copies of most journal articles on research at this Division can be purchased from the National Agricultural Library of the U.S. Department of Agriculture, Beltsville, Maryland 20705.

No publications will be sent regularly in response to foreign requests unless exchange arrangements have been made with the Director of the National Agricultural Library.

Copies of previous lists of publications and patents are available upon request.

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PUBLICATIONS

[Publications marked with an asterisk (*) are not available for distribution. When requesting reprints, please order by number. Use your zip code.]

- 2946 • Tremorgenic Toxins from *Penicillia*. III. Tremortin Production by *Penicillium* Species on Various Agricultural Commodities
C. T. Hou, A. Ciegler, and C. W. Hesseltine
Appl. Microbiol. 21(6): 1101-1103. June 1971

A low temperature (4° C.) favors accumulation of the mycotoxin, tremortin, when tremortin-producing molds are grown on various agricultural commodities. However, the rate of toxin formation is more rapid at a high temperature (20° C.).

- 2947 • Automation of Nitrogen Analysis of Grain and Grain Products
D. E. Uhl, E. B. Lancaster, and Charles Vojnovich
Anal. Chem. 43(8): 990-994. July 1971

A procedure was developed to determine the nitrogen content of some agricultural commodities in an automatic analyzer with accuracy and precision comparable to the Kjeldahl. Standards of material similar to the samples being analyzed contributed to better agreement between the two methods. The overall precision of both methods is estimated to be 2 or 3% of the measured mean value.

- 2948 • Linseed Oil. Emulsion for Curing and Protecting Concrete
[William L. Kubie]
North. Market. Nutr. Res. Div.
U.S. Agr. Res. Serv., CA-71-35, 5 pp. June 1971 [Processed]

- 2949 • Hydrolysis of Dialdehyde Starch with Sulfurous Acid
C. A. Wilham, T. A. McGuire, and C. L. Mehlretter
Staerke 23(6): 201-203. June 1971

A systematic investigation of the sulfurous acid hydrolysis of dialdehyde starch (DAS) was made in which temperature, time, and concentration of reagents were varied. Optimum yields of apparent D-erythrose and of glyoxal of 78 and 81% of theory were obtained by hydrolyzing 1.8% of DAS in water containing 14.7 moles of sulfur dioxide per mole of DAS for 1.33 hours at 100° C. Increased reversion and degradation at higher concentrations of DAS and at higher temperatures of hydrolysis rapidly decreased the yields of apparent D-erythrose and glyoxal.

- 2950 • Nomenclature of Bacteria with Special Reference to the Order *Actinomycetales*
Thomas G. Pridham
Int. J. Syst. Bacteriol. 21(2): 197-206. April 1971

The number of names for streptomycetes that is in the scientific literature now is exceeded only by those for organisms placed in the genus *Bacillus* Cohn 1872. The genus *Streptomyces* Waksman and Henrici 1943 may well rank in first place if names in the patent and quasiscientific literature are included. The overwhelming number of names and the lack of a precise definition of a particular species or subspecies, of type or neotype strains, and of certain essential details have brought about problems in assessing the status of many names. The major problems encountered in a 2-year study are discussed, and a simple format is suggested, use of which may help to clarify future nomenclature.

- 2951 • 11-Hydroxy-*trans*-8-dodecenoic Acid Lactone, a 12-Membered-Ring Compound from a Fungus
R. F. Vesonder, F. H. Stodola, L. J. Wickerham, J. J. Ellis,
and W. K. Rohwedder
Can. J. Chem. 49: 2029-2032. June 1971

The 12-membered lactone of 11-hydroxy-*trans*-8-dodecenoic acid is formed when the fungus *Cephalosporium recifei* NRRL 5161 is grown on glucose solution.

- 2952 • Separation of Soybean Isoflavones from Their 5-Hydroxy Derivatives by Thin-Layer Chromatography
L. C. Wang
Anal. Biochem. 42(1): 296-298. July 1971

Thin-layer chromatographic separation of two isoflavones in soybeans--daidzin and genistin--was better with aluminum oxide than with silica gel. The genistin fraction isolated from soybeans contained daidzin, genistein, and daidzein. Since aluminum oxide chelates with genistin, this chelation can be used to advantage in separating daidzin from genistin.

- 2953 • Critical Pigment Volume Concentration in Linseed Oil Films
R. L. Eissler and F. L. Baker
Appl. Polym. Symp. No. 16: 171-182. 1971

Photomicrographs taken with a scanning electron microscope appear to demonstrate clearly a relationship between pigment volume concentration (PVC) and structure of linseed oil films. At loadings above the critical pigment volume concentration (CPVC) films seem to form from individual particles, each having its own coating of vehicle. At pigmentations below critical, the particles are embedded in a continuous vehicle matrix. The structure can be most clearly observed in outer (nonsubstrate) surfaces and those formed by fracture. Structure of outer surfaces is influenced by factors other than PVC. Some specimens with internal structures characteristic of films with pigment loadings above the CPVC have outer surfaces composed of a continuous layer of vehicle. Pigment particles that sedimented into outer surfaces can be observed in films which were dried upside down. End points from a modified oil absorption test on several pigments occurred at PVC's higher than the CPVC of films formed from the same pigment-vehicle combinations used in testing. Photomicrographs of end point mixtures from these same oil absorption tests show a structure similar to that of films which do not contain CPVC. Also some artifacts, that are probably due to the metal coating on the specimens, have been described.

- 2954 • Disulfide Bonds: Determination, Location, and Influence on Molecular Properties of Proteins
J. S. Wall
J. Agr. Food Chem. 19(4): 619-625. July-August 1971

Determination and location of cystine residues are essential to protein characterization since their disulfide bonds stabilize chainfolding and multichain structure responsible for physical and biological properties. Reduction with mercaptans, such as dithiothreitol, in dissociating solvents is the choice procedure for attaining disulfide cleavage, since other methods may cause undesirable side reactions. Under selected conditions the resulting sulfhydryls can be specifically alkylated with α,β -unsaturated compounds to prevent their reoxidation. Determination of alkylated cysteine

residues supplements the cysteic acid method for cystine-cysteine analysis. Reoxidation studies on reduced proteins indicate that positions of formation of both intra- and interchain disulfide bonds are governed by amino acid sequences as well as by concentration, solvent, and pH. Location of disulfide bonds in peptides obtained by chromatography of proteolytic digests of proteins has been accelerated by automatic analysis with specific reagents. Disulfide interchange may change physical properties of proteins and must be avoided in characterization work.

2955 • Protein Aggregation as Studied by Sedimentation Equilibrium. Recent Developments in Instrumentation and Theory

Harald C. Nielsen and Alfred C. Beckwith

J. Agr. Food Chem. 19(4): 665-668. July-August 1971

Advances in instrumentation and theory have extended the usefulness of sedimentation equilibrium in studying reversibly aggregating protein systems. The best starting point in the description of an aggregating protein system is a graph of apparent molecular weight *vs.* concentration in a given solvent. Such a graph can be obtained with two or three sedimentation equilibrium experiments, whereas alternative methods, such as light scattering, require many experiments. The first step in the analysis of a sedimentation equilibrium experiment is the determination of protein concentration as a function of radius. Current methods for calculating concentration as a function of radius are described and procedures for calculating apparent molecular weight *vs.* concentration from such data are discussed and possibilities for automation are mentioned. An apparent molecular weight *vs.* concentration curve is useful in determining the molecular weight of the monomer, detecting paucidispersity and thermodynamic nonideality, and calculating association constants.

2956 • *Helminthosporium*: Secondary Metabolites, Southern Leaf Blight of Corn, and Biology

Clifford W. Hesseltine, John J. Ellis, and Odette L. Shotwell

J. Agr. Food Chem. 19(4): 707-717. July-August 1971

The recent outbreak of southern corn blight is caused by race T of *Helminthosporium maydis*, a species in the fungus genus *Helminthosporium* that consists of about 175 species, worldwide in distribution, on grasses. Three species of *Helminthosporium*--*H. maydis*, *H. turcicum*, and *H. carbonum*--attack corn and are placed in the genus *Bipolaris*. The southern corn blight fungus has an asexual stage and a sexual stage, *Cochliobolus heterostrophus* or *Ophiobolus heterostrophus*. Names of the sexual and asexual stages and synonyms of the species of *Helminthosporium* were sought in chemical literature to discover the types of compounds produced. Our survey brings together the known secondary metabolites including phytotoxins and pathotoxins which might be suspected mycotoxins. The pathotoxin of *H. maydis*, a polypeptide of unknown structure, induces all of the symptoms of the disease in susceptible corn plants that the pathogen will cause. *Helminthosporium* has been reported once as a human pathogen and is often an allergen.

- 2957 • A New Pathogenic Species of *Aspergillus*
 K. J. Kwon-Chung¹ and D. I. Fennell
 (¹National Institute of Allergy and Infectious Diseases,
 Bethesda, Md.)
 Mycologia 63(3): 478-489. May-June 1971

A new species, *Aspergillus bisporus*, isolated from soil collected at Clarksburg, Maryland, and Bainbridge, Georgia, is described. On standard media the species is characterized by conidial heads with uniseriate phialides bearing short chains of large, globose, black, coarsely dentate conidia and more specifically by the production of two conidial forms on high-sugar medium. The second type of conidial structure developed on M40Y agar bears long, light-olivish conidial chains consisting of smooth to slightly rough, globose to elliptical conidia. Incubation at 37-45° C. enhances the development of the second conidial form.

Conidia of *A. bisporus* survive for several months in brain, lung, liver, and spleen of mice without any evidence of multiplication. However, extensive growth causing chronic nephritis occurs in the kidney.

- 2958 • Industrial Uses of Gluten
 L. H. Krull and G. E. Inglett
 Cereal Sci. Today 16(8): 232-236, 261. August 1971

Proteins that have commercial utility possess either unique physical properties or economic advantages. Wheat gluten because of extensive intermolecular interactions, is unsuitable for existing markets. The gluten proteins do not lend themselves to fiber formation but they do form films. However, the intermolecular interactions leave the films with a characteristic brittleness. To overcome these properties, gluten has been modified by various chemical treatments. The products derived from hydrolytic cleavage were modified with ethylene oxide or ethylenimine to give derivatives with promising properties. Specific modification of glutamine side chains by esterification led to organic soluble polymers, where modification with hydrazine led to a more basic polymer. All functional groups were masked by graft polymerizing synthetic chains onto the proteins. This step not only overcame the hydrophilic character of the protein but also imparted stability.

The properties of these materials derived from gluten made them commercially acceptable; however, more testing and evaluation of the products are needed.

2959 • Jojoba Oil Wax Esters and Derived Fatty Acids and Alcohols:
Gas Chromatographic Analyses

Thomas K. Miwa

J. Amer. Oil Chem. Soc. 48(6): 259-264. June 1971

Hydrochloric acid-catalyzed ethanolysis followed by saponification readily surmounts the resistance of long chain wax esters to direct hydrolysis by alkali. Additionally, choosing ethyl instead of methyl esters allows baseline separations between long-chain alcohols and corresponding esters in gas liquid chromatographic (GLC) analysis of total alcohols and acid components before saponification. Liquid wax esters were analyzed on a temperature-programmed 3% OV-1 silicone column. Geographical and genetic effects on the variability of jojoba oil composition were investigated with five different seed samples. Major constituents in jojoba seed oil from shrubs in the Arizona deserts--as indicated by GLC analyses of oil, ethanolysis product, isolated fatty alcohols, and methyl esters of isolated fatty acids--were C_{40} wax ester 30%, C_{42} wax ester 50%, and C_{44} wax ester 10%; octadecenoic acid 6%, eicosenoic acid 35%, docosenoic acid 7%, eicosenol 22%, docosenol 21%, and tetracosenol 4%. Oil from smaller leaved prostrate plants growing along California's oceanside showed a slight tendency toward higher molecular size than oils from the California desert and Arizona specimens. The wax esters are made up of a disproportionately large amount of docosenyl eicosenoate and are not a random combination of constituent acids and alcohols. *Lunaria annua* synthetic wax ester oil served as a model for evaluating the analytical procedures.

2960 • Catalytic Effects in the Ammonolysis of Vegetable Oils

W. L. Kohlhase, E. H. Pryde, and J. C. Cowan

J. Amer. Oil Chem. Soc. 48(6): 265-270. June 1971

Catalysts for the ammonolysis of soybean oil are, in order of decreasing overall effectiveness, ammonium acetate, sodium methoxide, 9-aminononanoic acid, sodium soyate, ammonium nitrate, alanine, sodium acetate, and glycerol. At 125° C., a reaction time of 1 hour, and a 30:1 mole ratio of ammonia to ester, ammonium acetate achieved ammonolysis in 16%, 61%, and 84% conversions at the respective concentrations of 0.0, 0.1, and 1.0 mole per mole ester groups. Conversion was 98% complete in 4 hours with 1.0 mole. The ammonolysis generally exhibited the expected first order kinetics up to about 80% reaction.

2961 • Near IR Spectra of Long Chain Vinyl Derivatives

George E. McManis and Lyle E. Gast

J. Amer. Oil Chem. Soc. 48(7): 310-313. July 1971

The near infrared spectra of a series of compounds derived from long chain fatty acids and containing the vinyl structure were examined. These included 1-alkenes; acrylic, allyl, and vinyl esters; and allyl and vinyl ethers. The bands caused by the vinyl structure were observed clearly and usually without interference. These bands consist of overtones of the fundamental C-H stretching vibrations found in the normal infrared region and of combination bands. Interactions between the vinyl group and the rest of the molecule were observed by changes in location, shape, and intensity of the near infrared bands. Quantitative analysis for vinyl derivatives based on near infrared bands is usually convenient.

2962 • Lipoyxygenase-Oxidized Soap Stock as Source of Hydroxy Conjugated Octadecadienoic Acids

E. A. Emken and H. J. Dutton

J. Amer. Oil Chem. Soc. 48(7): 324-329. July 1971

A laboratory procedure was developed to produce hydroxy-conjugated octadecadienoic acids (HOCD). Lipoyxygenase oxidation of distilled or crude soap stock produces hydroperoxy-conjugated octadecadienoic acids, which can be reduced to HOCD. Crude aqueous soy flour extracts and defatted soy flour are convenient, effective, and inexpensive lipoyxygenase sources. This new procedure allows high substrate concentrations of 100 mg./ml. to be used while achieving 75 to 90% oxidation of the available linoleic acid during a reaction time of 20 to 40 minutes. Aqueous ethanol and dimethyl sulfoxide (DMSO) solvent systems were compared. The DMSO system gave hydroperoxy acids, with low enzyme concentrations, in higher yields. Hydroperoxide yields are good when short reaction times, high pH levels, and free radical scavengers are used.

2963 • Industrial Chemical Uses of Polyunsaturated Fatty Acids

E. H. Pryde and J. C. Cowan

J. Amer. Oil Chem. Soc. 48(7): 349-354. July 1971

Production of vegetable, animal, and marine oils containing more than about 40% unsaturated fatty acids totaled 15,000 million pounds in 1968, almost on the scale of petrochemical production. The greater share (64%) of this non-fossil oil production was directed toward food uses, the remainder toward industrial and animal feed uses. The variety of chemical reactions carried out on these unsaturated fatty acid products include hydrogenation, inter-esterification, dimerization, sulfation, formation of nitrogen compounds, epoxidation, alkaline cleavage, and oxidative ozonolysis. Some of these reactions have been developed at the Marketing and Nutrition Research Divisions of the Agricultural Research Service, U.S. Department of Agriculture. Research is continuing in developing new reactions for potential industrial application. An example is reductive ozonolysis of unsaturated fatty esters to produce monofunctional aldehydes and bifunctional aldehyde esters.

2964 • Mating Responses in *Candida lipolytica*

A. I. Herman

J. Bacteriol. 107(1): 371. July 1971

Culture medium that restricted cell multiplication increased fertility in selected heterothallic stocks of *Candida lipolytica* and triggered sporulation in newly formed diploids; a medium that supported vigorous cell growth prevented sporulation and permitted the newly formed diploids to bud.

2965 • Solvent Effects in the Absorption Spectra of the Ninhydrin Chromophore

Mendel Friedman

Microchem. J. 16(2): 204-209. June 1971

Visible spectra of the Ninhydrin chromophore, Ruhemann's purple, were studied in dimethyl sulfoxide (DMSO), formamide, *N,N*-dimethylformamide (DMF), and pyridine, as well as in mixed aqueous-nonaqueous solvent media. Large differences in both the position of absorption maxima and extinction coefficients for the two bands in the visible spectra in the various solvent media were observed. Both the absorption maxima and the extinction coefficients of the Ninhydrin chromophore were a linear function of the composition of DMSO-H₂O solvent media. The experimental evidence allows predictions of values for the two absorption maxima of Ruhemann's purple as a function of the nature of the solvent medium. In nonaqueous aprotic solvents (*i.e.*, DMSO and DMF), the maxima should be near 605 and 420 mμ; in nonaqueous aprotic solvents capable of undergoing charge-transfer interactions (*i.e.*, pyridine), near 550 and 420 mμ; and in nonaqueous protic solvents (*i.e.*, formamide), near 575 and 410 mμ. The maxima in aprotic media will be displaced to about 575 mμ (higher wavelength band) and 410 mμ (lower wavelength band) on dilution with protic solvents.

2966 • Linseed Oil as an Antispalling Compound

L. E. Gast, W. L. Kubie, and J. C. Cowan

Concr. Constr. 16(8): 331-334. August 1971

Concrete cured under polyethylene or by spraying with commercial wax or resin curing compounds, and subsequently treated with either a 50% solution of boiled linseed oil in mineral spirits or a 50% emulsion of boiled linseed oil in water, was penetrated at temperatures between 34° and 100° F. Penetration of antispalling compounds was greatest when the concrete was treated 1 month after curing. With concrete up to 35 days old and treated with a 50% solution or emulsion, all methods of curing tested gave similar penetration patterns with time.

2967 • Linseed Oil Emulsion for Bridge Decks

Dean Mayberry

Concr. Constr. 16(9): 383-384. September 1971

Bridge builders' experiences in curing concrete with linseed oil emulsions in Oklahoma and the city of Wichita confirm conclusions of laboratory studies by the Northern Division and research contractors. Linseed emulsion acts as an antispalling agent for at least 2 years after it is applied as curing agent, reducing labor and costs in road building and maintenance. It reduces hairline cracking of curing and the scaling and spalling that can damage even air-entrained concrete.

2968 • Selection and Characterization of a Pleomorphic Form and an L Form of *Bacillus pumilus* NRRL B-3275

H. R. Burmeister and C. W. Hesseltine

Can. J. Microbiol. 17(8): 1057-1060. August 1971

Bacillus pumilus NRRL B-3275 cultures contained spherical, osmotically sensitive cells after incubation for 7 days in a tryptone broth containing 7% NaCl. Subcultures from cells growing in the saline broth produced only L-form colonies when plated on tryptone agar with 7% NaCl and only rod-form colonies on nutrient agar. When the tryptone agar medium was supplemented with 1.7% NaCl, colonies of cells irregular in shape and size were observed in addition to L-form and rod-form colonies. Platings from successive weekly transfers made in tryptone broth with 7% NaCl yielded an increasing proportion of L-form and pleomorphic-form colonies while the ratio of rod-form colonies declined. Cells of the pleomorphic form are morphologically distinct from both the rod form and L form but are identical with the rod form in their growth requirements.

2969 • Physiology of Sporeforming Bacteria Associated with Insects. III. Radiorespirometry of Pyruvate, Acetate, Succinate, and Glutamate Oxidation

Lee A. Bulla, Jr., Grant St. Julian, and Robert A. Rhodes

Can. J. Microbiol. 17(8): 1073-1079. August 1971

Oxidation of pyruvate, acetate, succinate, and glutamate was compared in *Bacillus thuringiensis*, *B. alvei*, *B. lentimorbus*, and *B. popilliae*. Cells of *B. thuringiensis* and *B. alvei* in transition from vegetative growth to sporulation oxidized these substrates by tricarboxylic acid (TCA) cycle reactions. No TCA cycle activity was exhibited by *B. lentimorbus* and *B. popilliae* cells that do not sporulate. *B. popilliae* decarboxylated C-1 of pyruvate and glutamate; *B. lentimorbus*, C-1 of pyruvate only. *B. thuringiensis* and *B. alvei* oxidized pyruvate and acetate at a much higher rate in the absence of amino acids and related compounds than when these nutrients were exogenously supplied; in contrast, there was no appreciable increase in C-1 decarboxylation of pyruvate by *B. lentimorbus* and *B. popilliae*. No nutrient effect was observed on succinate and glutamate oxidation in any of these four organisms.

- 2970 • *Streptomyces torulosus* sp. n., an Unusual Knobby-Spored Taxon
A. J. Lyons and T. G. Pridham
Appl. Microbiol. 22(2): 190-193. August 1971

Several strains of a streptomycete with unusual spore wall ornamentation were isolated from Iowa soils. They are further characterized by coiled chains of spores, gray aerial mycelium, melanin-like pigments, and the production of antibacterial and antifungal antibiotics. Spore wall ornamentations, as seen with the transmission electron microscope, do not correspond with any of the four generally recognized categories of spore wall ornamentation--smooth, warty, spiny, or hairy--but seem to represent an intermediate position between warty and spiny. This unusual ornamentation consists of blunt projections rising out of an otherwise smooth surface and is termed "knobby." To obtain further information on the nature of the knoblike projections and their possible status in representing a defined spore wall ornamentation category, scanning electron micrographs and transmission electron micrographs representing all spore wall ornamentation categories were compared. Differentiation between the several categories was more difficult with the scanning electron microscope than with the transmission electron microscope.

- 2971 • Processing of Soybeans at the Industrial Level for Human Food, Animal and Poultry Feeds
R. J. Dimler
Proc. E. Africa Regional Seminar on Production, Utilization, and Marketing of Soybeans, Kampala, Uganda, pp. 30-31.
February 1971

Some of the more recent developments in the United States are reviewed on the processing of soybeans to provide protein for human foods and for animal and poultry feed. Also pointed out are some of the important processing steps needed to get high-quality products.

- 2972 • Vegetable Proteins in the World Food Supply
R. J. Dimler
Proc. E. Africa Regional Seminar on Production, Utilization, and Marketing of Soybeans, Kampala, Uganda, pp. 32-43.
February 1971

In considering vegetable proteins from the viewpoint of world food supply, the present consumption of broad classes of vegetable proteins is reviewed. Then, the possibility of increased food use of oilseed proteins is indicated as a means of overcoming protein deficiencies. Major attention is given to soybean proteins because of the significant success that already has been attained in their use and the further progress that can be anticipated. The protein products from soybeans provide guidelines on important properties and methods of usage that must be considered in seeking additional sources of supplementary protein.

- 2973 • Publications and Patents of the Northern Marketing and Nutrition Research Division, January-June 1971
North. Market. Nutr. Res. Div.
U.S. Agr. Res. Serv., Unnumb. Pub., 65 pp. [August 1971]
- 2974 • Distribution of Tocopherols in Wet- and Dry-Milled Corn Products
G. W. Grams, C. W. Blessin, and G. E. Inglett
Cereal Chem. 43(4): 356-359. July-August 1971

The concentration of tocopherols and tocotrienols was determined in wet- and dry-milled corn products. Although recovery of dry matter and oil was good by both milling operations, loss of tocopherols was observed. The respective recoveries of alpha-tocopherol and total tocopherols were 68 and 73% after dry milling and 18 and 27% after wet milling. Tocopherols were highly concentrated in the germ products from both dry milling (196 p.p.m.) and wet milling (85 p.p.m.). The other corn products, therefore, had a low tocopherol content (grits, 15.4 p.p.m.; flour, 16.7 p.p.m.; and high-fat meal, 26.8 p.p.m.). The difference between total tocopherol concentrations in the germ products from wet and dry milling suggested that the manner in which this product was treated contributed to the observed loss of tocopherols.

- 2975 • Denaturation of Soybean Proteins by Isoelectric Precipitation
A. M. Nash, W. F. Kwolek,¹ and W. J. Wolf
(¹USDA Biometrical Services, Peoria, Ill.)
Cereal Chem. 48(4): 360-368. July-August 1971

Water extracts of soybean meal were acidified with hydrochloric acid; neutralized; equilibrated with a buffer of pH 7.6, ionic strength 0.5, containing 0.01 M mercaptoethanol; and analyzed in an ultracentrifuge. Loss of solubility in the buffer, as compared to a nonacidified control, served as a criterion of denaturation. Factors causing denaturation were time of acid treatment and extremes of acidity. Two-hour acidification of water extracts to pH 4.5 decreased solubility and total ultracentrifuge area of the globulin fraction about 12%, with decreases in 2S, 7S, 15S, and >15S fractions. Alkylation of sulfhydryl groups did not prevent these losses. When whey was removed before neutralizing, protein solubility was reduced and all ultracentrifugal fractions decreased in area. Even though no loss of protein solubility occurred on pH 4.5 treatment of water extracts that were dialyzed to remove phytates, total ultracentrifuge areas decreased. The 7S and 11S fractions accounted for most of the area losses. Although stable on titration of a water extract to pH 4.5, the 11S protein showed marked sensitivity to lower pH values. The 7S and 11S fractions decreased in water extractability with aging of the meal.

2976 • Lysine-Infused Popcorn

C. W. Blessin, J. F. Cavins, and G. E. Inglett
Cereal Chem. 48(4): 373-377. July-August 1971

The lysine content of commercial yellow popcorn was increased by infusing kernels with aqueous solutions of L-lysine monohydrochloride. Infusion studies included examination of a number of time, temperature, and concentration variables. Lysine content was increased from 0.32% in unprocessed kernels to 3.0% in infused. Approximately 61% of the lysine in infused kernels was recovered when they were popped. Relative popping expansion of an infused corn sample containing 1% lysine was 70% of that with non-infused popcorn. Relative popping expansions of 60 and 55% occurred at the 2 and 3% lysine levels, respectively. No significant difference was detected in flavor between popped samples, either noninfused or infused.

2977 • Nutritive Value of Protein in Hominy Feed Fractions

J. S. Wall, C. James, and J. F. Cavins
Cereal Chem. 48(4): 456-465. July-August 1971

To ascertain if hominy feed is processed for optimal use as a feed ingredient, compositional analyses and nutritional evaluations were conducted on it and on components produced under different conditions. Hominy feed constitutes 27 to 35% of total dry-milled corn products and consists mainly of bran and bran meal, oil cake, and fine feed composed of degerminator fines and tailing meal. The level of protein in hominy feed (12%) exceeds that of corn (9%). Amino acid analyses conducted on hominy-feed fractions indicate that they contain higher levels of lysine, tryptophan, and other essential amino acids than whole corn or corn grits. However, processing conditions influence the actual nutritional value of protein in hominy-feed fractions. The nutritionally available lysine determined by reaction with 2,4-dinitrofluorobenzene is less than the total lysine of hominy feeds. Rat feeding studies showed differences in protein quality between corn germ processed by expeller to remove oil and germ extracted by solvent. Properly processed hominy feed can serve as a good protein source in nonruminant diets.

2978 • Storage Stability of CSM: Alternate Formulations for Corn-Soy-Milk

G. N. Bookwalter, H. A. Moser, W. F. Kwolek,¹
V. F. Pfeifer, and E. L. Griffin, Jr.

(¹USDA Biometrical Services, Peoria, Ill.)

J. Food Sci. 36(5): 732-736. July-August 1971

Corn-soy-milk (CSM), a high-protein food supplement for children, contains pregelatinized corn meal, soy flour, nonfat dry milk, vitamins, and minerals. To increase the choice of possible ingredients, several formulations were studied. Flavor and chemical tests after storage at 77°, 100°, and 120° F. were made on experimental samples containing corn meals and soy flours, dry whey, increased levels of nonfat dry milk, sucrose, and dextrose hydrate. Stability was adequate for all formulations tested except those containing dextrose hydrate or unprocessed whole corn meal. At storage temperatures of 100° F. or above, substantial losses in available lysine occurred in the samples containing dextrose hydrate.

2979 • Storage Stability of CSM: Increasing Fat to 6% in Corn-Soy-Milk Blends

G. N. Bookwalter, H. A. Moser, L. T. Black, and
E. L. Griffin, Jr.

J. Food Sci. 36(5): 737-741. July-August 1971

CSM is a high-protein food supplement for infants and preschool children; it consists of partially gelatinized corn meal, toasted soy flour, and nonfat dry milk and is fortified with vitamins and minerals. The original CSM formulation contained only 2% fat. Storage stability characteristics were determined for CSM blends containing as much as 6% fat. The fat sources tested were corn germ, full-fat soy flour, refined soybean oil, expeller crude corn oil, and a combination of high-fat corn meal with full-fat soy flour. Tests for changes in flavor, free fatty acids, peroxide values, and available lysine were made on blends stored at 120° F. for 56 days, 100° F. for 6 months, and 77° F. for 1 year. Higher fat content was associated with improved palatability. Flavor scores declined at about the same rate under all test conditions. In experimental blends containing crude corn oil, palatability varied with the particular sample tested. One sample of crude corn oil was satisfactory while another caused off-flavors in the blends.

2980 • Production and Use of Oilseed Proteins

R. J. Dimler

J. Amer. Oil Chem. Soc. 48(8): 400-402. August 1971

The worldwide production of the major oilseeds is reviewed, along with indications of their importance as protein sources either directly in human foods or indirectly for animal feeds. In general, direct food use is limited but could be expanded to help meet world protein needs. Problems to be solved relative to increased food use include protein source, processing, distribution, and consumption, including cost and acceptance. The successes achieved by soybeans in the food field demonstrate some of the potentials for the oilseeds.

2981 • Survey of Corn from Different Regions for Aflatoxin, Ochratoxin, and Zearalenone

Odette L. Shotwell, C. W. Hesseltine, Elsie E. Vandegraft, and Marion L. Goulden

Cereal Sci. Today 16(9): 266-270, 273. September 1971

Of the 293 corn samples collected from 10 ports and assayed, eight contained <6 to 25 p.p.b. aflatoxin B₁, and one of these contained G₁ as well as B₁. One sample was in U.S. sample grade (SG), three were in grade U.S. No. 4, three in U.S. No. 3, and one in U.S. No. 2. *Aspergillus flavus* was isolated from seven of the eight samples, and *A. parasiticus* was isolated from the remaining positive sample. Three samples contained ochratoxin A (83 to 166 p.p.b.), two in grade U.S. No. 4, and one in U.S. No. 3. Zearalenone (450 to 750 p.p.b.) was present in five samples--one in SG, one in U.S. No. 4, and three in U.S. No. 3.

2982 • Automated Data Acquisition System and Computer Analysis for Sedimentation Equilibrium Experiments

A. C. Beckwith, H. C. Nielsen, and R. O. Butterfield

Anal. Chem. 43(11): 1471-1474. September 1971

A method is presented which shows that commercially available digital voltmeters and high speed paper tape punches can be used to digitize the analog output from a photoelectric scanner attachment on the analytical ultracentrifuge. Equations which are used in a computer analysis of the digital information are developed. Computer output can be presented in a variety of ways for the convenience of the experimenter, but most generally is shown as apparent molecular weight *vs.* concentration. The method provides better than a 30-fold decrease in the time required to carry out a complete analysis over manual methods while using at least a 10-fold increase in the amount of information across the solution column at equilibrium.

- 2983 • Graft Copolymers of Starch with Mineral Acid Salts of Dimethylaminoethyl Methacrylate. Preparation and Testing as Flocculating Agents
George F. Fanta, Robert C. Burr, C. R. Russell, and C. E. Rist
J. Appl. Polym. Sci. 15(8): 1889-1902. August 1971

Mineral acid salts of dimethylaminoethyl methacrylate (DMAEMA) have been graft polymerized onto starch with ferrous ammonium sulfate-hydrogen peroxide initiation. The nitric acid salt was used in most reactions, and graft polymerizations were run in both water and aqueous-organic solvent systems. Increased monomer concentration in water led to an increase in both the percentage of poly(DMAEMA·HNO₃) in the graft copolymer (percent add-on) and the molecular weight of grafted branches. Variations in initiator concentration altered the percent add-on only slightly but affected the molecular weight of grafted polymer significantly. When swollen starch, in contrast with unswollen starch, was used in graft polymerization reactions run in water, the product had a higher percent add-on and a larger number of grafted branches of lower molecular weight. The efficiency of starch-poly(DMAEMA·HNO₃) graft copolymers as flocculants for diatomaceous silica increased with percent add-on; however, variations in grafting frequency and graft molecular weight had less effect on the behavior of these materials as flocculants.

- 2984 • Oxygenated *Trans*-3-Olefinic Acids in a *Stenachaenium* Seed Oil
R. Kleiman, G. F. Spencer, L. W. Tjarks, and F. R. Earle
Lipids 6(8): 617-622. August 1971

Interesting differences were found in oils from two samples of *Stenachaenium macrocephalum* (Compositae) seed with dissimilar storage histories. One contained significant amounts of epoxy acids (6.5%) and hydroxy conjugated dienolic acids (5.6%), but the other contained no more than 1% of these oxygenated acids. Characterization of components in the former oil established that the principal epoxy acid (4.0%) is the previously unknown *cis*-9,10-epoxy-*trans*-3,*cis*-12-octadecadienoic acid. The conjugated dienols include two additional new acids with Δ³ unsaturation (2.5%): 9-hydroxy-*trans*-3,*trans*-10,*cis*-12-octadecatrienoic and 13-hydroxy-*trans*-3,*cis*-9,*trans*-11-octadecatrienoic acids. The nonoxygenated acids, except for the large amount (40%) of *trans*-3,*cis*-9,*cis*-12-octadecatrienoic, are those that commonly occur in seed oil.

2985 • Some Optical Properties of *S*- β -(4-Pyridylethyl)-L-Cysteine and Its Wheat Gluten and Serum Albumin Derivatives

Y. Victor Wu, James E. Cluskey, L. H. Krull, and Mendel Friedman

Can. J. Biochem. 49: 1042-1049. 1971

The optical properties of *S*- β -(4-pyridylethyl)-L-cysteine (PEC) and its bovine serum albumin (BSA) and wheat gluten derivatives were studied in 0.01-0.1 *N* HCl. Optical rotatory dispersions (ORD), circular dichroism (CD), ultraviolet (UV), and infrared (IR) spectra were obtained of PEC, BSA, BSA reduced with mercaptoethanol and alkylated with 4-vinylpyridine (PE-BSA), BSA reduced with mercaptoethanol and alkylated with acrylonitrile (CN-BSA), gluten, gluten reduced with mercaptoethanol and alkylated with 4-vinylpyridine (PE-gluten), and gluten reduced with mercaptoethanol and alkylated with acrylonitrile (CN-gluten). IR spectra of the proteins showed the presence of α -helical and unordered conformations. The UV absorption at 254 m μ of PEC and PE-BSA depends on pH; a pK value near 6 for the pyridyl group was obtained by spectrophotometric titration. The possible use of PEC as a conformation probe was explored. The ORD of PEC depends on concentration, solvent, and pH but not on ionic strength. The ORD data of proteins were analyzed by the Moffitt-Yang method to get α -helical contents. These helical contents indicate that there is not enough interaction left to support α -helix in gluten with disulfide bonds broken at pH 2.2. However, approximately one-third of the helical content of BSA persists without the aid of disulfide bonds.

2986 • Cost Analyses for New Products and Processes Developed in USDA Laboratories

V. E. Sohns

J. Amer. Oil Chem. Soc. 48(9): 362A, 364A, 382A. September 1971

Cost analyses frequently help to implement the research and development program on new products and processes from farm crops. Having cost data available encourages early adoption and application by industry of products and processes that are developed. Furthermore, cost estimates provide information that can serve as a guideline for developing an effective plan of work for research projects. The procedures used to compile cost estimates at the Northern Division follow those generally recommended by most cost engineers with appropriate modifications to fit particular situations. Accuracy of an estimate depends upon the quantity and quality of the process data made available to the cost engineer. Both order of magnitude estimates prepared shortly after studies on a process are initiated on a laboratory scale and preliminary cost estimates prepared either from extensive laboratory studies or from process engineering studies in the pilot plant have found application in research investigations. A typical example of such applications is found in our program for evaluating the industrial potential of several nylons which can be produced from *Crambe abyssinica* oil.

2987 • Copper in Edible Oils: Trace Amounts Determined by Atomic Absorption Spectroscopy

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(¹USDA Biometrical Services, Peoria, Ill.)

J. Amer. Oil Chem. Soc. 48(9): 438-441. September 1971

The application of atomic absorption spectroscopy to trace copper analysis in fats was investigated. Copper spectral resonance lines 3248 Å and 3274 Å possess the most useful sensitivities applicable to fats and vegetable oils. These sensitivities were determined to be 0.15 and 0.25 p.p.m. in oil, respectively, with detection limits about tenfold lower. Data show that copper absorption depends strictly on the amount of oil aspirated into the flame. In soybean oil-solvent mixtures, aspiration rates decrease logarithmically and linearly with increasing fat content. The accuracy and precision of atomic absorption techniques were established by comparing results from atomic absorption with those from two independent techniques. Error estimates were determined by analysis of copper-hydrogenated soybean oil diluted to low copper levels. The standard deviation, relative standard deviation, and analytical error were 0.0108 p.p.m., 5%, and 2.5%, respectively, over a range of 0.05-0.40 p.p.m. copper in soybean oil.

2988 • Odor and Flavor Responses to Additives in Edible Oils

C. D. Evans, Helen A. Moser, and G. R. List

J. Amer. Oil Chem. Soc. 48(9): 495-498. September 1971

The odor threshold was determined for a series of unsaturated ketones, secondary alcohols, hydrocarbons, and substituted furans added to bland edible oil. Odor thresholds were taken as the point where 50% of a 15- to 18-member taste panel could detect an odor difference from the control oil. These additives are oxidative products of fats, but the concentrations investigated were far below any level associated with an identifying odor or taste of the additive per se. Odor, rather than flavor, was selected as the starting basis because of greater acuity and ease of handling a large number of samples with less taster fatigue. Oil samples containing additive concentrations near odor threshold levels were evaluated by flavor score and flavor descriptions. Taste panel members were experienced oil tasters and were allowed free choice in selecting terms to describe the flavor quality of the oil samples. The propyl and butyl members of the homologous series of vinyl ketones had the lowest odor thresholds, whereas the difference in odor threshold was small between homologs in unsaturated alcohols and in 2-substituted furans. Vinyl propyl ketone, vinyl propyl carbinol (1-hexen-3-ol) and 2-propyl furan had odor thresholds of 0.005, 0.5, and 6 p.p.m., respectively. Odor thresholds of unsaturated hydrocarbons are markedly lower than those of saturated isologs. The odor of nonane can be detected at 650 p.p.m. However, at 1,000 p.p.m. it cannot be tasted and oils containing it were scored equal to the control oil. 1-Nonene, 1-nonyne, and other tested C-9 unsaturated hydrocarbons, including a number of dienes, have odor thresholds of about 10 p.p.m. The hydrocarbons 1-hexyne, 1-nonyne, and 1-decyne had odor thresholds of 0.2, 5, and 4 p.p.m., respectively.

2989 • Hydrogenation of Soybean Oil With Commercial Copper-Chromite and Nickel Catalysts: Winterization of Low-Linolenate Oils

K. J. Moulton, R. E. Beal, and E. L. Griffin, Jr.

J. Amer. Oil Chem. Soc. 48(9): 499-502. September 1971

Soybean oil hydrogenated in the presence of copper-chromite catalysts to 3% linolenate and below requires winterization if it is to pass the cold test. Yields of winterized oil from soybean oil hydrogenated to several linolenate levels were therefore studied. Partially hydrogenated soybean oil was sampled and filtered at intervals during hydrogenation on a pilot-plant scale with a commercial copper-chromite catalyst. Samples were then vacuum bleached and filtered to remove dissolved copper, held at 7° C. for 48 hours, and filtered to remove stearines. The filtered winter oils passed the standard 5.5 hour cold test. For soybean oil in which linolenate was reduced to 0.1% with a commercial copper-chromite catalyst or to 3.0% with a nickel catalyst yields of winter oil were about the same: 92% for a 5.5-hour cold test oil (winterized two days at 7° C.) and 89% for a 20-hour cold test oil (winterized two days at 4° C.).

2990 • *Vibrio* Mutants of *Rhodospirillum rubrum*

J. W. Newton

Biochim. Biophys. Acta 244(2): 478-480. August 1971

A new class of morphological mutants was isolated from *Rhodospirillum rubrum* by selection for resistance to D-cycloserine. These mutants were of vibrio morphology and showed impaired uptake of D-alanine.

2991 • Vehicle Compatibility in Emulsion Coatings

L. H. Princen

Appl. Polym. Symp. No. 16: 209-220. 1971

Compatibility between latex particles and linseed oil (LSO) in dry, unpigmented films, cast from blended emulsions, has been examined by scanning electron microscopy (SEM). Morphology of surfaces and fracture edges was studied on films from blends of LSO emulsion with emulsions of polybutadiene styrene (PBS), polyacrylic latex, and polyvinyl acetate.

Concentration ratios were varied from 100% LSO to 100% latex in steps of 10%. Emulsion stability was excellent at all levels of blending for all three latexes. Compatibility in the dry film was good with PBS only; *i.e.*, the film is uniform and the LSO and PBS appear mutually dissolved. The other latexes gave films with a patchwork of LSO and latex, both on the surface and internally. For the first time through SEM certain surface textures, such as microrippling, can be seen, and small areas of one polymer surrounded by another can be recognized or even identified. In applying this information to coatings a few questions remain to be resolved, such as: Are the patches of LSO in films of incompatible latex beneficial in improving adhesion properties of latex emulsion paints? Are there advantages in blending LSO and compatible latexes in paints for improving adhesion or other properties?

- 2992 • Reaction of Sodium Hypochlorite With Amines and Amides: A New Method for Quantitating Amino Sugars in Monomeric Form
Paul A. Sandford, Alice J. Nafziger, and Allene Jeanes
Anal. Biochem. 42(2): 422-436. August 1971

Free and *N*-acetylated hexosamines can be determined spectrophotometrically by a three-stage assay: chlorinating the amide or amine with NaOCl; reducing unreacted NaOCl with NaNO₂; and reacting chloroamide (-amine) with amylose-KI reagent to produce the blue amylose-triiodide complex, measured at 615 nm. Distinctive behavior of the common 2-amino-2-deoxy-D-hexoses and their 2-acetyl derivatives allows three types of measurements to be made: (a) identification and differentiation by characteristic behavior (assay individually in primary cacodylate buffers over the pH range 6.0-9.5, then adjust pH to 5.5 with secondary phthalate buffer and remeasure the color); (b) assay individually in a single buffer at the optimum pH; and (c) assay differently admixed 2-amino-2-deoxy-D-hexose·HCl and 2-acetamido-2-deoxy-D-hexose (assay in primary buffer at pH 9.0-9.5 gives measure of only HexNAc (no reaction with ManNAc), then adjust pH to 5.5 with secondary buffer to measure additional color that results only from HexN·HCl).

- 2993 • Production of D-Mannitol by Conidia of *Aspergillus candidus*
G. E. N. Nelson, D. E. Johnson, and A. Ciegler
Appl. Microbiol. 22(3): 484-485. September 1971

Conidia of *Aspergillus candidus* converted glucose and other sugars to mannitol. Low pH (ca. 3.0) apparently favored the percentage yield but decreased the fermentation rate.

- 2994 • Two New Saturn-Spored Species of *Pichia*
L. J. Wickerham and C. P. Kurtzman
Mycologia 63(5): 1013-1018. September-October 1971

Saturn-spored species of the genus *Pichia* are uncommon. Of the 35 species and two varieties of *Pichia* recognized by Kreger-van Rij, only two species have Saturn-shaped ascospores; the remaining species have either hat-shaped or spherical spores. *Pichia mucosa* sp. nov. was isolated from topsoil in a wooded area in Illinois. This species is homothallic and forms unconjugated asci that do not rupture. There are from one to two Saturn-shaped ascospores per ascus. Glucose is the only sugar fermented, but many common sugars are assimilated. This species is unique to *Pichia* because it produces substantial amounts of an extracellular polysaccharide. The polysaccharide is neutral and the only sugar component is D-mannose. *Pichia sargentensis* sp. nov. was isolated from the outlet of a small lake in New Hampshire. This species is also homothallic, but approximately 10% of the asci are conjugated. There are from one to four Saturn-shaped ascospores per ascus. The asci do not rupture. This species fermented only glucose, and sugar assimilation is restricted to glucose, cellobiose, D-xylose, and L-rhamnose.

- 2995 • Predicting Storage Stability from Time-Temperature Data
 W. F. Kwolek¹ and G. N. Bookwalter
 (¹USDA Biometrical Services, Peoria, Ill.)
 Food Technol. 25(10): 1025-1026, 1028, 1030-1031, 1037.
 October 1971

Methods are given to assist in choosing an appropriate equation relating product quality to storage time and temperature and for determining the constants of the equation. Figures prepared from these equations show contours of constant product quality as related to time and temperature. From the plotted contours, storage conditions can then be divided into those associated with "acceptable" or "unacceptable" products. Even with a limited amount of data, stability can be predicted over a wide range of time-temperature conditions. The methods are illustrated with several examples.

- 2996 • Pyrolysis of Some Acetoxynonenes
 G. R. List, C. D. Evans, E. Selke, C. A. Glass,
 R. L. Hoffmann, and G. E. McManis
 Lipids 6(9): 635-640. September 1971

Current studies on odor thresholds of hydrocarbons autoxidatively derived from fats required the preparation of 1,3- and 2,4-nonadienes. The pyrolysis of 3-acetoxy-1-nonene (I) and 4-acetoxy-2-nonene (II) was investigated as a route to 1,3- and 2,4-nonadienes, respectively. The acetates were pyrolyzed over pyrex helices at 400° C. Distilled pyrolyzates were characterized by mass, ultraviolet, infrared, and nuclear magnetic resonance spectroscopy, along with gas chromatography. Since II gave approximately a 50:50 mixture of the 1,3- and 2,4-isomers, an earlier observation was confirmed that allylic esters may rearrange before elimination. Ester I gave about 85% of the 1,3-isomer and 15% of the 2,4. Presumably the 2,4-isomer arises from thermal rearrangement. In pyrolysis, both I and II give conjugated products almost exclusively. Ultraviolet spectroscopy shows ϵ values in the 24,000 to 28,000 range.

- 2997 • Determination of Cellulose and Apparent Hemicellulose
 in Plant Tissue by Gas-Liquid Chromatography
 J. H. Sloneker
 Anal. Biochem. 43(2): 539-546. October 1971

A gas-liquid chromatography method is described by which neutral aldoses and cellulose can be measured in whole and digested plant tissue. Apparent hemicellulose is measured by difference. Accuracy of the method is unaffected by protein in concentrations up to 75%.

- 2998 • Mechanism of the Reaction of Benzyl Alcohols with a Cyclic *Trans* Carbonate
Edward I. Stout, William M. Doane, and Kenneth E. Kolb¹
(¹Bradley University, Peoria, Ill.)
J. Org. Chem. 36(21): 3126-3130. October 1971

The mechanism was studied of carbonate ring opening of methyl 4,6-*O*-benzylidene- α -D-glucopyranoside 2,3-carbonate (I) by various para-substituted benzyl alcohols in the presence of triethylamine. The reaction is first order in both I and the amine-alcohol complex. The rate of carbonate ring opening was in the order $\text{NO}_2 > \text{Cl}, \text{Br} > \text{H} > \text{CH}_3$ for the para-substituted benzyl alcohols. This order correlates with the shift of the OH stretching frequency obtained when benzyl alcohol derivatives are complexed with triethylamine. The effect of solvent on the reaction rate of I with benzyl alcohol was determined for 16 solvents. Rate values correlate well with the hydrogen bonding and dielectric properties of the solvents.

- 2999 • Determination of *Cis* and *Trans* in Monoene and Diene Fatty Esters by Gas Chromatography
E. A. Emken
Lipids 6(9): 686-687. September 1971

A gas-chromatography method has been developed for quantitative determination of the *cis* and *trans* content in monoene and diene C₁₈ fatty esters. In order to achieve separation of the *cis*- and *trans*-monoene and diene isomers, the fatty esters are first epoxidized with peracetic acid. The epoxidation procedure is simple and stereoselective. Positional and geometric isomerization of the double bond does not occur. The gas chromatography analysis requires no exotic equipment, reagents, or techniques and utilizes standard columns packed with EGSS-X. Satisfactory analyses were obtained for synthetic mixtures containing oleate-elaidate and *trans,trans*-, *cis,trans*- and *cis,cis*-dienes.

- 3000 • Ultraviolet Absorption Maxima of Sugars Containing a Thiocarbonyl Group
B. S. Shasha, D. Trimnell, W. M. Doane, and C. R. Russell
Carbohydr. Res. 19(3): 383-388. October 1971

Absorption maxima (λ) and extinction coefficients (ϵ) are reported of 46 sugar derivatives each containing a thiocarbonyl group. The list includes thionocarbonates $\text{ROC}(\text{S})\text{OR}$, xanthides $\text{ROC}(\text{S})\text{SSC}(\text{S})\text{OR}$, trithiocarbonates $\text{RSC}(\text{S})\text{SR}$, oxythiocarbonyl trithiocarbonate $\text{RSC}(\text{SO})\text{SR}$, thiocarbamates $\text{ROC}(\text{S})\text{N}^<$, chlorothioformates $\text{ROC}(\text{S})\text{Cl}$, xanthates $\text{ROC}(\text{S})\text{SNa}$, hydroxythiothiocarbonates $\text{ROC}(\text{S})\text{SOH}$ and their methyl esters $\text{ROC}(\text{S})\text{SOMe}$, xanthoanhydrides $\text{ROC}(\text{S})\text{SC}(\text{S})\text{OR}$ and the carbonyl analogue $\text{ROC}(\text{O})\text{SC}(\text{S})\text{OR}$, thio(thiocarbonyl) dimethyl phosphonate $\text{ROC}(\text{S})\text{SP}(\text{O})(\text{OMe})_2$, xanthate esters $\text{ROC}(\text{S})\text{SR}$, and dithiocarbonate $\text{RSC}(\text{S})\text{OR}$.

- 3001 • Purification of Commercial Maltose and Improved Detection of Oligosaccharides on Paper Chromatograms
J. Lehrfeld
Carbohydr. Res. 19(3): 400-401. October 1971

A short, wide, charcoal column was used to remove the approximately 10% oligosaccharide impurities found in commercial maltose. Prespraying of developed paper chromatograms with amyloglucosidase markedly increased sensitivity of the AgNO_3 in acetone-KOH in ethanol detection reagents to these oligosaccharide impurities.

- 3002 • Synthesis and N.M.R. Spectra of Substituted Methyl 6-Deoxy-6-halo- α -D-glucopyranosides
H. B. Sinclair and L. W. Tjarks
Carbohydr. Res. 19(3): 402-406. October 1971

On the basis of an improved method previously reported for the displacement of carbohydrate sulfonates with halide ions, five substituted methyl 6-O-methanesulfonyl or 6-p-tolylsulfonyl- α -D-glucopyranosides were converted to the corresponding chloro-, bromo-, and iodo-glucopyranosides--15 compounds in all, ten of them previously unreported.

The nuclear magnetic resonance spectra of the deoxyhaloglucopyranosides exhibit a regular downfield chemical shift of the 4, 5, and 6,6' protons on varying the 6-halo group from I to Br to Cl. A long-range shielding effect of a benzoyl carbonyl group on the 3, 4, and 5 protons also occurs.

- 3003 • Alkali Isomerization-Gas Chromatography With the Microreactor Apparatus
E. D. Bitner, Alan C. Lanser, and H. J. Dutton
J. Amer. Oil Chem. Soc. 48(10): 633-635. October 1971

A simple and rapid method of simultaneously conjugating polyunsaturation and forming methyl esters from triglyceride oils, other esters, and fatty acids has been developed by using the microreactor apparatus (MRA). These reactions occur while a mixture of tetramethylammonium hydroxide and sample of fat is being injected into a gas chromatograph from the MRA reaction chamber. The speed of this microanalysis is limited only by peak elution and peak integration times. Analyses of soybean oil and six partially hydrogenated fats have been compared with those previously obtained by the alkali isomerization spectrometric method. The amount of conjugation that occurs during the reaction is a measure of the linoleic acid in the oil. This procedure should prove useful for rapid microscale analysis of conjugatable dienes in a variety of samples, including edible fat products.

- 3004 • Rheological Method of Investigating Reaction Between Cerium(IV) and Starch
L. A. Gugliemelli and C. R. Russell
J. Polym. Sci., Part B, 9(10): 711-716. October 1971

In the reaction between gelatinized waxy corn starch (WCS) and ceric ammonium nitrate [175 anhydroglucose units/cerium(IV)] dissolved in nitric acid at 25° C., starch-cerium(IV) complexes are formed that possess cationic charges. Because charge intensity of the complex depends both on age and nitric acid concentration of cerium(IV) solution, hydrolysis of ceric ammonium nitrate apparently occurs in the reagent. Viscosities of WCS-cerium(IV) dispersions, because of cationic charges, were reduced by different anions in the order $\text{PO}_4^{3-} > \text{SO}_4^{2-} > \text{NO}_3^-$.

- 3005 • Starch in Rubber. Powdered Elastomers from Starch-Encased Latex Particles
R. A. Buchanan, H. C. Katz, C. A. Russell, and C. E. Rist
Rubber J. 153(10): 28, 30, 32, 35, 88-91. October 1971

Starch and flour derivatives that act as rubber-reinforcing agents served as encasing materials for latex particles. The particles and derivatives were coprecipitated from aqueous mixtures and then oven-dried to give friable crumbs that ground readily to powders. Particle size distribution of the powders depended on elastomer, starch content, and grinding conditions. Powdered starch-elastomers were mixed with compounding ingredients in a high-speed rotary blade blender to produce powdered compounds ready for vulcanizing. Curing characteristics of these compounds did not change during 30 days' storage at room temperature. Rubber articles were fabricated by direct heat-compression molding of powdered compounds. Vulcanizates possessed higher quality when the powders were fluxed by milling for a short period or by extrusion. Since good rubber products were fabricated by direct extrusion from powder feed, injection molding should be practical with a screw-plasticating machine. General-purpose oil-extended SBR 1713 powder and NBR powder were prepared on a 100-pound batch scale and appeared suitable for a wide variety of end uses. Their respective costs were estimated at 16.6 and 46.9 cents per pound.

- 3006 • Reaction of Sodium Hypochlorite with Amines and Amides. A New Method for Quantitating Polysaccharides Containing Hexosamines
Paul A. Sandford, Alice J. Nafziger, and Allene Jeanes
Anal. Biochem. 44(1): 111-121. November 1971

The NaOCl-amylose-KI spectrophotometric method for determining free and *N*-acetylated amino sugars has been applied to the analysis of a polysaccharide (NRRL Y-6272) produced extracellularly by a black yeast and composed of *N*-acetylglucosamine and *N*-acetylglucosaminuronic acid. Y-6272, as well as other amino sugar-containing polysaccharides such as chondroitin

sulfate A, colominic acid, heparin, and hyaluronic acid, can be assayed readily in the range of 0.04 to 0.30 μ mole *N* without previous depolymerization.

Studies of the effects of pH and reaction time and temperature, carried out on several glycosaminoglycans as well as on various glucosamine derivatives and oligosaccharides, indicate that color yield is influenced by the amino sugars present and also by the position and anomeric type of linkages. Since color yield accords well with the nitrogen content of a particular amino sugar-containing polysaccharide, unknown quantities in solutions or column effluents can be determined readily and accurately by reference to calibration curves of the individual polysaccharide.

3007 • Reaction of Sodium Hypochlorite with Amines and Amides:
Automation of the Method

J. A. Bietz and Paul A. Sandford

Anal. Biochem. 44(1): 122-133. November 1971

The spectrophotometric NaOCl-amylose-KI method for analysis of free and *N*-acetylated hexosamines in monomeric and polymeric forms, amino acids, peptides, and proteins was automated, and the method's specificity was studied. Hexosamines react as in the manual assay. Significant differences in reactivity of amino acids led to a study of the effect of pH on the extent of the reaction. An automatic gradient titration method was devised to vary the pH of the primary reaction between 7.0 and 10.0. Results may be used to determine optimal reaction conditions for each amino acid and to differentiate amino acids; there are several reasons for differences in reactivity. The assay is especially useful for peptides, since amide N is generally more reactive than amine N. The method is suitable for continuous monitoring of column chromatographic effluents, as well as for analysis of individual samples as in the manual assay.

3008 • Corn and Potato α -1,4-Glucan: α -1,4-Glucan 6-Glycosyltransferase:
Evidence for Separate Hydrolytic and Branching Components

H. L. Griffin and Y. Victor Wu

Biochemistry 10(23): 4330-4335. November 1971

The hydrolytic and branching activities of branching enzyme preparations separated on DEAE-cellulose result from the functions of two separate enzymes. Two fractions can be separated from the DEAE-cellulose preparations by zonal ultracentrifugation or by membrane ultrafiltration. A high molecular weight fraction ($M = 70,000$) hydrolyzes amylose. The nature of this enzyme depends on its source. That from potato branching enzyme, like β -amylase, stops near branch points. That from dent and waxy corn, like α -amylase, can bypass branch points. A lower molecular weight fraction ($M \approx 20,000$) introduces barriers to β -amylolysis in amylose without apparent hydrolysis. Composites of the fractions will reproduce the effect of the original DEAE-cellulose branching enzymes on the structure of amylose.

- 3009 • Physiology of Sporeforming Bacteria Associated with Insects.
IV. Glucose Catabolism in *Bacillus larvae*
Grant St. Julian and Lee A. Bulla, Jr.
J. Bacteriol. 108(2): 828-834. November 1971

Bacillus larvae appears to be unique among related bacilli in that it contains enzymes of the Embden-Meyerhof-Parnas, pentose phosphate, and Entner-Doudoroff pathways. Simultaneous occurrence of enzymes of all three metabolic pathways has not until now been reported in other *Bacillus* species. Radiorespirometric analyses of specifically labeled glucose catabolism reveal that vegetative cells of *B. larvae* dissimilate glucose predominately via a direct oxidative route and to a lesser extent by a nonoxidative scheme although specific activities of enzymes of all three pathways are comparable. Predominance of an oxidative pathway is unusual and also has not been reported for other bacilli. Studies on the oxidation of pyruvic, acetic, succinic, and α -ketoglutaric acids show that terminal respiration of cells in transition from vegetative growth to sporulation involves both the tricarboxylic acid and glyoxylic acid cycles. The relationship of these findings to the fastidiousness and oligosporogeny of *B. larvae* is discussed.

- 3010 • Continuous Removal of Metallic Ions from Soybean Oil
R. E. Beal and V. E. Sohns
J. Amer. Oil Chem. Soc. 48(10): 539-543. October 1971

Removal of metallic ions like copper, nickel, and sodium from vegetable oils is important to edible oil processors. Continuous washing of soybean oil with acidic water, followed by ion exchange treatment of the aqueous solution to remove metallic cations and permit reuse of the water, is an effective and economical method for metal removal. Several types of washing apparatus were studied: A Podbielniak countercurrent centrifugal contactor, a rotating disc countercurrent contactor, and a contactor-centrifuge system. Equipment for the third system is already available for the continuous washing of refined oil in modern refineries. With a contactor-centrifuge ion-exchange system, copper in soybean oil was reduced by washing from 1.5 to 0.03 p.p.m.; nickel, from 0.4 to 0.04 p.p.m.; sodium, from 20 to <1 p.p.m. The effects of pH and type of acid (anion) were studied. The cost of washing soybean oil by this method is estimated to be about 0.06 cent/pound, and there is no loss of oil.

- 3011* • Aflatoxin and Related Compounds
R. W. Detroy, E. B. Lillehoj, and A. Ciegler
In "Microbial Toxins," vol. 6 "Fungal Toxins," eds.
Alex Ciegler, Solomon Kadis, and Samuel J. Ajl, chap. 1,
pp. 3-178. New York. 1971

The various aspects of aflatoxin as a mycotoxin and a carcinogen are reviewed. These aspects include molds involved, commodities affected, factors affecting toxin production, pharmacology, and biochemistry.

- 3012* • Patulin, Penicillic Acid, and Other Carcinogenic Lactones
 A. Ciegler, R. W. Detroy, and E. B. Lillehoj
 In "Microbial Toxins," vol. 6 "Fungal Toxins," eds.
 Alex Ciegler, Solomon Kadis, and Samuel J. Ajl, chap. 6,
 pp. 409-434. New York. 1971

The toxic and carcinogenic properties of patulin, penicillic acid, and various lactones are reviewed. These compounds are produced as secondary metabolites by various fungi and may act as mycotoxins.

- 3013 • Steroid Esterase Bound to Porous Glass Beads
 M. J. Grove, G. W. Strandberg, and K. L. Smiley
 Biotechnol. Bioeng. 13(5): 709-711. September 1971

A steroid esterase from *Corynebacterium* sp. NRRL B-3791 was bound covalently to porous glass beads according to published methods. The enzyme-glass complex catalyzed the hydrolysis of testosterone acetate and was stable on storage at 4° C. for more than 3 months.

- 3014 • Biochemistry of Milky Disease: Primary Pathways of Glucose Catabolism of Healthy and Diseased Japanese Beetle Larvae
 Lee A. Bulla, Jr., Grant St. Julian, Gordon L. Adams,
 and Robert A. Rhodes
 Proc. IV Int. Colloquium on Insect Pathology, College Park, Md.,
 pp. 229-236. August 25-28, 1970

The primary catabolic pathways for utilization of carbohydrate in healthy third-instar Japanese beetle larvae (*Popillia japonica*) and in those infected with the milky disease bacterium, *Bacillus popilliae*, were studied by radiorespirometry using ¹⁴C-labeled glucose. Both healthy and infected larvae dissimilated glucose via the Embden-Meyerhof-Parnas (EMP) and pentose-phosphate (PP) pathways. Relative participation of concurrent pathways varied during the course of infection. Maximum utilization of the PP pathway and concomitantly diminished EMP activity occurred in larvae during development of the disease, which is characterized by extensive bacterial spore formation and correspondingly decreased vegetative proliferation.

3015 • Evidence for Glutenin in Wheat: Stability Toward Dissociating Forces

F. R. Huebner and J. A. Rothfus

Cereal Chem. 48(5): 469-478. September-October 1971

The hypothesis that glutenin is an artifact of classic isolation procedures was examined by extraction of wheat proteins into urea solutions or phenol-acetic acid-water mixtures and by gel filtration of glutenin after sonication. After extraction of flour with water and then 2*M* urea, nitrogen recovered in dialyzed extracts and in the starch residue totaled 127% of that originally in the flour; 43% remained in the residue. Lyophilization and redialysis of all urea extracts and the residue lowered nitrogen recovery to 98% with 34% remaining in the residue. Nitrogen in the residue was reduced to 17% of the original amount by further extraction with 0.2*N* acetic acid. Subsequent treatment of the residue with mercaptoethanol and acrylonitrile and extraction with dilute acetic acid left less than 6% of the nitrogen insoluble. Gel filtration and gel electrophoresis showed that all urea extracts contained glutenin-like material along with low-molecular-weight proteins. Final extractions with dilute acetic acid removed glutenin with only a trace of gliadin. Ultrasonics dissociated glutenin and made it tractable enough to be separated on agarose columns in urea buffer at pH 9.2. The results support the contention that glutenin is highly aggregated and different from gliadin. The data show that urea extraction does not remove all protein from wheat flour.

3016 • Dry-Milling of *Opaque-2* (High-Lysine) Corn

O. L. Brekke, E. L. Griffin, Jr., and P. Brooks

Cereal Chem. 48(5): 499-511. September-October 1971

Because *opaque-2* (*o*₂) corn is deficient in horny endosperm, studies were undertaken to learn what modifications of the dry-milling process might be necessary to produce prime products (grits, meal, and flour) of acceptable quality and yield. A range of tempering conditions and two types of degermers were investigated with corn from several sources. If degermer fines are included, prime products in good yield and acceptable fat content were obtained when the corn was tempered to 23% or higher moisture levels. Degerming was adequate in either a Beall degermer or an experimental machine. Grit yield was low and flour yield high because of the soft kernel. No flaking grits were recovered. The degermer fines contained only 0.5 to 1.5% fat. Prime products had a lower protein content than those from a dent corn. Because of insufficient density differences between germ and endosperm particles, gravity table separators cannot be used. Except for this aspect, *o*₂ can be dry-milled with conventional equipment. A greater variation was noted between different varieties of *o*₂ corn than for corn from different crop years.

3017 • Effect of Alkali Dehulling on Composition and Wet-Milling Characteristics of Sorghum Grain

C. W. Blessin, R. A. Anderson, W. L. Deatherage, and
G. E. Inglett

Cereal Chem. 48(5): 528-532. September-October 1971

Three sorghum grains (RS-626, TE-77, and a commercial sample of U.S. No. 2 yellow) were selected to determine the effectiveness of aqueous solutions of sodium hydroxide (NaOH) as dehulling agents. Various times (2, 4, 6, and 8 minutes); temperatures (140°, 160°, and 180° F.); and concentrations (15, 20, and 25% w/w) were investigated. A 20% solution of NaOH at 160° F. essentially removed the pericarp in 4 to 8 minutes and left the endosperm and germ intact. The treated grain was washed, neutralized with acetic acid, and washed again. Microscopic inspection of stained kernels showed that the major portion of the aleurone layer was not removed with this treatment. Under these conditions, average yield of dehulled sorghum grain was 92%. Ash, ether extract, and protein levels were not significantly affected by alkali dehulling. Fiber contents of the dehulled products were approximately 50% of the level of the whole grain. When dehulled grain was wet-milled, there was a loss of 5 to 8 percentage points in starch recovery. However, protein content of the starch was about the same as in starch recovered from whole grain. Color of starch from dehulled grain appeared whiter. More and cleaner germ with higher oil content was recovered from dehulled grain. From an overall processing standpoint, 6 minutes was an optimum dehulling time with 20% NaOH at 160° F.

3018 • Endosperm Fragmentation of Ordinary and High-Lysine Corn

D. D. Christianson, A. C. Stringfellow, D. Burdick,
and G. E. Inglett

Cereal Chem. 48(5): 558-567. September-October 1971

Upon treatment with isotonic buffer, the endosperm of either hand-dissected corn or selected dry-milled products--grits, meal, and flour--fragmented into fine particles that gave improved protein shifting upon air classification. Release of adhering protein from starch granules was demonstrated by optical and scanning electron microscopy. More than 50% of the total protein was shifted into two high-protein fractions by air classification of treated flours from ordinary and high-lysine corns compared to 20 to 33% for untreated flours. Protein concentrates from endosperm products of high-lysine corn have potential for use in low-cost foods. Low-protein fractions may be suitable for industrial applications.

- 3019 • Occurrence of *Cis*-6-Hexadecenoic Acid as the Major Component of *Thunbergia alata* Seed Oil
G. F. Spencer, R. Kleiman, R. W. Miller, and F. R. Earle
Lipids 6(10): 712-714. October 1971

An unusual series of monoenoic fatty acids constitutes about 85% of the total acids in seed oil from *Thunbergia alata*. The major component in the oil, *cis*-6-hexadecenoic acid (82%), is accompanied by the homologous 4-tetradecenoic (*ca.* 0.2%) and 8-octadecenoic (1.8%) acids. Another homologous series is represented by 5-tetradecenoic (*ca.* 0.2%), 7-hexadecenoic (1.8%) and the familiar 9-octadecenoic (4.4%) acids. Traces (<0.1%) of three other acids, 6-tetradecenoic and 10- and 11-octadecenoic, are also present along with palmitic (5.8%), stearic (0.6%) and linoleic (2.2%) acids. Some of the monoenoic acids have not previously been known to occur in seed oils.

- 3020 • Stereospecific Hydration of Unsaturated Fatty Acids by Bacteria
L. L. Wallen, E. N. Davis, Y. V. Wu, and W. K. Rohwedder
Lipids 6(10): 745-750. October 1971

Three new 10-hydroxy fatty acids, all optically active, have been prepared by the anaerobic microbiological hydration of a *cis*-9 double bond. Substrates that formed these new hydroxy fatty acids are linoleic, linolenic, and ricinoleic acids. The hydroxyl group has the D configuration and the methyl esters are levorotatory. Infrared, mass spectral, specific rotation, and ultraviolet data on these compounds were determined. There was no migration of the unreacted double bonds at C₁₂ and C₁₅ in linoleic or linolenic acids. The presence of a double bond in the 10-hydroxy fatty acids significantly increased the optical rotation of the methyl esters. The hydratase enzyme showed unusual specificity among Δ^9 unsaturated acids. While it hydrates methylene interrupted and hydroxy unsaturated acids, it failed to hydrate either 9-decenoic, 12,13-epoxy- or 12-keto-*cis*-9-octadecenoic acids or sterculic acid.

- 3021 • Sorghum Prolamins: Their Optical Rotatory Dispersion, Circular Dichroism, and Infrared Spectra
Y. Victor Wu, James E. Cluskey, and Richard W. Jones
J. Agr. Food Chem. 19(6): 1139-1143. November-December 1971

The molecular conformation of sorghum prolamin was explored because of its high levels of nonpolar amino acids, its strong tendency to gel, and its poor solubility. Conformations of prolamin from four hybrids of grain sorghum were studied by optical rotatory dispersion (ORD), circular dichroism (CD), and infrared spectra in several solvents. Infrared absorption spectrum of prolamin in 60% *tert*-butyl alcohol (*tert*-BuOH) and D₂O showed the presence of α -helix and unordered structure, as well as the absence of

β -structure. ORD data of the prolamins in 60% *tert*-BuOH give α -helix content of 40-47% independent of hybrids and of color of the prolamins solution. The α -helix content of the prolamins in 60% *tert*-BuOH + 1.5 M guanidine hydrochloride (G-HCl) is lowered somewhat to 34-40%, but is greatly reduced in 6 M G-HCl. The CD and far ultraviolet ORD curves of decolorized prolamins give α -helix content in agreement with that from ORD data. The high level of α -helix for sorghum prolamins supports the concept that hydrogen bonds between backbone polypeptide chains are protected from aqueous or other polar residues by a nonpolar environment resulting from the side chains.

- 3022 • Determination of Lignin in Non-Wood Plant Fiber Sources
M. O. Bagby, G. H. Nelson, E. G. Helman, and T. F. Clark
Tappi 54(11): 1876-1878. November 1971

Lignin contents of representative non-wood plants were determined by a 2-hour treatment at 5° C. with 80% sulfuric acid. Representative genera were selected to give data on stem fibers, leaf or hard fibers, and forages. The results were compared with those of a 16-hour, 72% sulfuric acid procedure from the literature. Relative standard deviations for the materials by the two methods are comparable; *i.e.*, ± 2.41 -3.48% and ± 2.74 -3.60% with 80 and 72% acid, respectively. Analysis of variance showed significant differences between the materials at the 99% confidence level. However, at the 95% confidence level, differences due to method were found only for hard-fibered leaf material. The considerable time savings afforded by the 2-hour (5° C.), 80% sulfuric acid method is desirable. The 80% sulfuric acid method has been adopted in our laboratory as the one of choice for determining lignin in fibrous non-wood plants.

- 3023 • Nylon-9 Via 9-Aminononanoic Acid from Soybean Oil
William R. Miller, Everett H. Pryde, Richard A. Awl,
William L. Kohlase, and D. Joe Moore
Ind. Eng. Chem., Prod. Res. Develop. 10(4): 442-447.
December 1971

9-Aminononanoic acid was prepared from soybean oil by a four-step process. Alcoholysis of the oil gave alkyl esters of the component fatty acids. Reductive ozonolysis of these esters gave an alkyl azelaaldehyde used for reductive alkylation of ammonia. The alkyl 9-aminononanoate was not isolated but hydrolyzed directly to 9-aminononanoic acid. Yields in the reductive alkylation-hydrolysis were better than 90% of crude amino acid purified by precipitation from water with an organic nonsolvent. Polymerization by heating at atmospheric pressure gave nylon-9 of high molecular weight. Nylon-9 fibers prepared by melt spinning had strengths comparable to those of commercial nylons.

3024* • Oxygen Transfer in Fermentation and Other Particle Suspensions

Paul M. Schierholz,¹ George T. Tsao,¹ and Earl B. Lancaster
(¹Iowa State University, Ames)

J. Chin. Inst. Chem. Eng. 2: 39-48. 1971

An equation describing the process of gas-liquid mass transfer with chemical reaction involving microscopic particles is solved for several specific cases. The results are also presented in graphical form where necessary. The solutions show that the presence of microscopic particles reacting with the solute increases k_L over that of physical absorption.

3025 • Growth of *Xanthomonas campestris* Is Not Simply Nutrient-Limited

Reuven A. Moraine and Peter Rogovin

Can. J. Microbiol. 17(11): 1473-1474. November 1971

Successful use of urea as supplemental nitrogen source shows that growth of *Xanthomonas campestris* is not simply nutrient-limited. While distillers' solubles concentration determines initial growth rate, other factors cause growth to stop.

3026 • Fractionation and Properties of Alkylated-Reduced Corn Glutelin Proteins

J. W. Paulis and J. S. Wall

Biochim. Biophys. Acta 251(1): 57-69. October 1971

The disulfide bonds of glutelin protein from corn endosperm were cleaved to yield polypeptide chains, which were both physically and chemically investigated. After the protein was reduced with mercaptoethanol and alkylation with acrylonitrile of resulting sulfhydryls, about 87% was soluble in 6 M guanidine-HCl and 47% in 0.3 M acetic acid, whereas native protein was much less soluble in both solvents. Gel filtration chromatography on different media with these same solvents established that the polypeptide chains were heterogeneous in molecular weight and appeared to aggregate in acetic acid. Fractionation of the alkylated-reduced glutelin by repeated chromatography on crosslinked dextran in 6 M guanidine-HCl yielded six peaks with components that differed in electrophoretic mobilities on starch gel. Direct extraction with 70% ethanol of the alkylated-reduced protein complex yielded a fraction that contained components mainly present in three of the chromatographic peaks and were similar in some properties to zeins. Molecular weight, gel electrophoretic mobilities, and amino acid compositions of all the isolated fractions indicate that glutelin in mature corn endosperm consists of a series of unique proteins which form a structural matrix stabilized by disulfide bonds.

- 3027 • Pulping of Kenaf Bark and Woody Fractions: Preliminary Investigations
 T. F. Clark, M. O. Bagby, R. L. Cunningham, G. F. Touzinsky, and W. H. Tallent
In "Non-Wood Plant Fiber Pulping--Progress Report No. 2," CA Report No. 40, Technical Association of the Pulp and Paper Industry, Atlanta Ga., pp. 267-278. 1971

Bark and core fractions from topped, defoliated kenaf stalks were processed individually to pulps by several techniques. Chemical and physical characteristics of conventional sulfate pulps from these two starting materials and from whole stalks were used as a basis for evaluation of the other treatments explored. As expected, bark fraction pulps in general had greater freeness, gave lower Kappa values, were more easily bleached, and developed greater strength properties than pulps from the woody core or from unfractionated stalks.

- 3028 • IR Spectra of Long Chain Vinyl Derivatives
 George E. McManis and Lyle E. Gast
 J. Amer. Oil Chem. Soc. 48(11): 668-673. November 1971

Differences in their infrared (IR) spectra are used to identify and analyze compounds containing a monosubstituted ethylenic (vinyl) group. Variations in location, shape, and intensity of the various bands due to this structure were studied. Although previous work was briefly reviewed, emphasis was on new information obtained from IR spectra of long chain vinyl compounds related to vegetable oils, including 1-alkenes, acrylic esters, allyl esters and ethers, vinyl esters, vinyl ethers, and vinyl ketones. In IR spectra of long chain (C_{10} - C_{18}) vinyl compounds bands caused by the vinyl structure show clearly and, usually, without interference. These bands consist of stretching vibrations of the vinyl olefinic bond and the three vinylic C-H bonds, and of in-plane and out-of-plane deformations of the C-H linkages. Since the vinyl group and neighboring groups influence one another, the interactions of vinyl groups with carbonyl groups and single C-O bonds, as in esters and ethers, were investigated.

- 3029 • Hydroxylaliphatic Acids in Branched Copolymers With Acyl Chloride-Terminated Long Side Chains: A New Shrink-Resist Treatment for Wool
 M. J. Diamond,¹ H. L. Needles,² C. A. Elliger,¹ D. J. Kertesz,³ E. N. Frankel, and G. Fuller¹
 (¹Western Regional Research Laboratory, Berkeley, Calif.;
²University of California, Davis; ³Syntex Laboratories, Inc., Palo Alto, Calif.)
 J. Amer. Oil Chem. Soc. 48(11): 678-681. November 1971

Two synthetic routes were followed to prepare graft copolymers with long side chains containing acyl chloride terminal groups. In the first of these methods acryloxy aliphatic acyl chlorides were synthesized from ricinoleic acid, 12-hydroxystearic acid, and 10-hydroxydecanoic acid and then polymerized with other acrylate ester comonomers. In the second procedure, a prepolymer was formed by copolymerizing acryloyl chloride with acrylate esters. The prepolymer then was treated with 12-hydroxystearic acid or 9(10)-hydroxymethylstearic acid to produce polymers with side chains having terminal carboxylic acid groups. These polymers were made more reactive by conversion to acid chlorides. The active polymers were applied to wool fabrics; the imparted shrink-resistance was durable under an accelerated wash test procedure. An added advantage of the treatment is a soft "hand" or feel resulting from internal plasticization of the polymer coating.

3030 • Organic Acids as Builders in Linear Alkylbenzene Sulfonate Detergent Formulations

C. A. Wilham and C. L. Mehlretter

J. Amer. Oil Chem. Soc. 48(11): 682-683. November 1971

Sodium salts of citric, glycolic, diglycolic, and three sugar acids, directly derived from D-glucose, were evaluated as builders in a formulation for a linear alkylbenzene sulfonate detergent. Only sodium citrate and diglycolate were at least 60% as effective as sodium tripolyphosphate in building action in hard water. Detergency appeared to be related to calcium sequestration by the salts at pH 10.

3031 • Edible Oil Evaluation by Room Odor Tests: A Preliminary Report

C. D. Evans, Helen A. Moser, G. R. List, H. J. Dutton,
and J. C. Cowan

J. Amer. Oil Chem. Soc. 48(11): 711-714. November 1971

Room odors developed on heating edible fats in open vessels were evaluated and characterized by a 20-member odor panel. Edible fats tested were: special soybean salad and cooking oils, hydrogenated soybean oil, and some commercial salad and cooking oils. Factors were investigated that affect reliability and reproducibility of the test and the acuity of the panel members. The effects of fry temperature and size of sample were also investigated. The method has been applied to a study of hydrogenated and unhydrogenated soybean oil samples.

3032 • Industrial Uses of High-Erucic Oils

H. J. Nieschlag and I. A. Wolff¹

(¹Eastern Regional Research Laboratory, Philadelphia, Pa.)

J. Amer. Oil Chem. Soc. 48(11): 723-727. November 1971

Vegetable oils rich in erucic acid have desirable properties for a variety of applications. At present, only a fraction of the potential that exists for commercial exploitation of high-erucic oils in the United States is fulfilled with 10 million pounds of rapeseed oil imported annually. Though rape is not a crop in the United States, another member of the mustard family, crambe, has been recommended by the USDA as a practical crop for domestic cultivation. Compared to rapeseed oil, crambe oil is more suitable for industrial use because it consistently contains a higher percentage of erucic acid.

High erucic oils, as exemplified by crambe, can be employed as lubricants in continuous steel casting, in formulated lubricants, and in the manufacture of rubber additives. Both the hydrogenated oil and derived wax esters have properties comparable to commercial waxes.

Useful nitrogen derivatives can be prepared from either the erucic acid or mixed acids from the oil; behenyl amine is used in a corrosion inhibitor, disubstituted amides are effective plasticizers, and erucamide is an excellent slip and antiblocking agent for plastic films.

Oxidative ozonolysis of erucic acid produces the dibasic acid, brassylic, and the monoacid, pelargonic. Mixed diacids, mainly brassylic and azelaic, can be obtained by ozonolysis of fatty acids from the oil. Alkyl diesters of brassylic or of the mixed diacids, are excellent low-temperature plasticizers.

Two new nylons (13 and 1313), which are derived from C-13 difunctional products of erucic acid ozonolysis, contain repeating units that have longer uninterrupted polymethylene chains than other nylons. Moderate melting points and exceptionally low water absorption are a consequence of this structure. The low-melting characteristic is an advantage in adhesive uses and facilitates fluidized-bed coating, molding, and extrusion; low moisture affinity contributes to excellent properties and dimensional stability.

3033 • Starch in Rubber. Influence of Starch Type and Concomitant Variables in Reinforcement of Styrene-Butadiene Rubbers

R. A. Buchanan, W. F. Kwolek,¹ H. C. Katz, and C. R. Russell

(¹USDA Biometrical Services, Peoria, Ill.)

Staerke 23(10): 350-359. October 1971

These studies allowed selection of four starch derivative styrene butadiene elastomer (SBR) masterbatch compositions for future optimization studies.

The main factor remaining to be optimized is level of resorcinol-formaldehyde (RF) incorporation; but fine adjustment of such factors as starch loading and plasticizer incorporation is needed also.

Results in these experiments suggest that further study of certain high-amylose starch compositions might lead to masterbatches giving vulcanizates with both low water adsorption and good strength properties. Further work is also needed on oil-extension of starch derivative-SBR masterbatches.

Properties of selected starch-SBR masterbatches met requirements of the rubber industry for many end-use applications.

3034 • Aconitic Acid Determination by Gas-Liquid Chromatography

C. L. Mehltretter and J. G. Otten

Int. Sugar J. 73(872): 235-237. August 1971

A combined procedure of lead aconitate precipitation and gas-liquid chromatography has been developed for the quantitative determination of aconitic acid in sugar process products.

3035 • Relative Standard Deviations in Determinations of Amino Acids

W. F. Kwolek¹ and J. F. Cavins

(¹USDA Biometrical Services, Peoria, Ill.)

J. Ass. Off. Anal. Chem. 54(6): 1283-1287. November 1971

Eighteen references were selected for computation of the relative standard deviation in determinations of amino acids. Cysteine, tryptophan, tyrosine, and methionine were associated with higher relative standard deviations than other amino acids. A mean relative standard deviation of about 8%, ranging from 5.9 to 14.1% depending on the amino acid, was observed between samples independently hydrolyzed. The relative standard deviation between aliquots of the same hydrolyzate was 2.7%. Differences in amino acids of 10 to 12% are statistically significant when two means, each based on two hydrolyses, are compared.

3036 • Corn Meal/Soy Flour Blends: Characteristics and Food Applications

G. N. Bookwalter, W. F. Kwolek,¹ L. T. Black, and

E. L. Griffin, Jr.

(¹USDA Biometrical Services, Peoria, Ill.)

J. Food Sci. 36(7): 1026-1032. November-December 1971

Protein quantity and quality of degermed corn meal were improved by supplementation with toasted defatted soy flour. Taste panel results indicated no significant change in preference, acceptability, and similarity to corn meal when as much as 20% toasted defatted soy flour was contained in the

blend. Flavor stability was adequate in blends containing toasted defatted, commercial processed full-fat, or extrusion-cooked full-fat soy flours at the 15% level. Product color was changed more by the inclusion of toasted defatted than of full-fat soy flour in the blends. Satisfactory performance was found in chapatti and northern corn bread containing degermed corn meal with and without 15% toasted defatted, 20% commercial processed full-fat, or 35% extrusion-cooked full-fat soy flours.

3037 • A Review of the Composition, Properties, and Distribution of Some Important Wheat Flour Constituents

J. S. Wall

Cereal Sci. Today 16(12): 412, 414-417, 429. December 1971

Wheat flour is a complex substance, consisting of many structural components as evidenced by electron microscopy. New methods of isolation and characterization have established that the lipids, proteins, and pentosan components of flour are mixtures of diverse substances. The unique structures of these substances all contribute to the functionality of wheat flour. The interactions of different compounds are facilitated by these varied functional groups and molecular structures. Differences in functional properties of wheat flour from various genetic sources may be attributed to differences in amounts and structures of proteins and pentosan-containing components.

3038 • Quantitative Determination of Tremortins in Agricultural Commodities

C. T. Hou, A. Ciegler, and C. W. Hesselstine

J. Ass. Off. Anal. Chem. 54(5): 1035-1036. September 1971

The procedure described for the quantitative determination of tremortins in agricultural commodities involves extracting the agricultural commodity with chloroform-methanol (2:1, v/v), followed by thin-layer chromatography and colorimetric assay. This procedure was successfully applied to the analysis of tremortin A added to grains and the production of tremortins A and B on various commodities.

3039 • The Structure of Pinnatanine, A New Amino Acid Amide from *Staphylea pinnata* L.

M. D. Grove, M. E. Daxenbichler, D. Weisleder, and C. H. VanEtten

Tetrahedron Lett. (47): 4477-4480. November 1971

Pinnatanine, isolated in 3% yield from defatted seed meal of *Staphylea pinnata* L. (European bladdernut, Staphyleaceae), has been characterized as N⁵-(2-hydroxymethylbutadienyl)-L-*allo*-γ-hydroxyglutamine. Acid hydrolysis of pinnatanine yields L-*allo*-γ-hydroxyglutamic acid, ammonia, and 4-vinyl-1-cyclohexen-1,4-dicarboxaldehyde. The dialdehyde results from Diels-Alder dimerization of the transient 2-methylene-3-butenal from pinnatanine. Pinnatanine has also been found in *Hemerocallis fulva* L. (common orange day lily, Liliaceae).

3040 • Influence of Starch Granule Swelling on Graft Copolymer Composition. A Comparison of Monomers

George F. Fanta, Robert C. Burr, W. M. Doane, and C. R. Russell

J. Appl. Polym. Sci. 15(11): 2651-2660. November 1971

Seven monomers, which varied widely in water solubility and ionic charge, were graft polymerized onto both unswollen starch and starch that had been swollen by heating in water to 60° C. Polymerizations were initiated with ferrous ammonium sulfate hexahydrate-hydrogen peroxide and, where applicable, with ceric ammonium nitrate. Graft copolymers were freed of ungrafted homopolymer by solvent extraction and were characterized by weight percentage of synthetic polymer incorporated in the graft copolymer, molecular weight of grafted branches, and grafting frequency. The influence of starch granule swelling on graft copolymer structure varied with the monomer used and could not be predicted on the basis of water solubility of monomer or its resulting polymer. With acrylonitrile and acrylamide, swollen starch gave higher molecular weight and less frequent grafts than unswollen starch. However, methyl methacrylate, *N,N*-dimethylaminoethyl methacrylate·HNO₃, *N*-*t*-butylaminoethyl methacrylate·HNO₃, and 2-hydroxy-3-methacryloyloxypropyltrimethylammonium chloride produced less frequent grafts of higher molecular weight when starch was unswollen. With acrylic acid, graft molecular weight was independent of starch granule swelling, although grafting was less frequent when swollen starch was used.

3041 • Microbial Transformation of Flavonoids

Alex Ciegler, Lloyd A. Lindenfelser, and George E. N. Nelson
 Appl. Microbiol. 22(6): 974-979. December 1971

Many fungal spores and resting vegetative mycelia have the ability to transform naringin and naringenin. In general, only hydrolytic cleavage of the sugar moieties of naringin produced prunin and naringenin. Two cultures, *Penicillium charlesii* and *Helminthosporium sativum*, also produced two unidentified flavonoid compounds but in low yields. No aglycone was transformed, although the compound was metabolized by some cultures when supplied as the glycoside. A new fluorodensitometric method was developed for the quantitative analysis of flavonoid compounds.

3042 • Cationic Graft Copolymer of Dialdehyde Starch as a Paper Additive

C. L. Mehltrittter and W. B. Roth
 Tappi 54(12): 2029-2030. December 1971

Cationic graft copolymers of dialdehyde starch and poly[2-hydroxy-3-methacryloyloxypropyltrimethylammonium chloride(I)] containing 7.8, 13.8, and 20.7% of grafted I were prepared in an aqueous system with ferrous ammonium sulfate-hydrogen peroxide initiation. Aqueous dispersions of the products added to unbleached softwood sulfate pulp at 1 and 2% levels produced handsheets having significantly improved wet- and dry-tensile strength properties.

3043 • Reaction of Trimethyl Phosphite with Bis(1,2:3,4-di-O-isopropylidene- α -D-galactopyranose) 6,6'-[Dithiobis(thioformate)]

B. S. Shasha, W. M. Doane, and C. R. Russell
 Carbohydr. Res. 20(2): 407-412. December 1971

1,2:3,4-Di-O-isopropylidene- α -D-galactopyranose 6-O-dithiocarbonate anhydrosulfide with O,O'-dimethyl phosphorothioate (III) was prepared by reaction of bis(1,2:3,4-di-O-isopropylidene- α -D-galactopyranose) 6,6'-[dithiobis(thioformate)] (II) with trimethyl phosphite (I). Compound III decomposes on standing to give D-galactose. Upon treatment with alkali, III forms the corresponding xanthate salt; with acid III loses the phosphonate and the acetal groups; with chlorine followed by sodium iodide it forms the corresponding chlorothioformate derivative; with pyridine it gives bis(1,2:3,4-di-O-isopropylidene-6-O-thiocarbonyl- α -D-galactopyranose) monosulfide (VI); and with hydrogen peroxide it initiates the polymerization of acrylamide to form a high-molecular-weight product.

- 3044 • Removal of Pyridine from TMS Carbohydrate Samples
 Jacob Lehrfeld
 J. Chromatogr. Sci. 9(12): 757-758. December 1971

Pyridine was removed from gas-liquid chromatography samples maintained under reduced pressure with a stream of dry air and was replaced with another inert solvent. The process required about 15 minutes, and quantitation of the components showed no change in relative proportions.

- 3045* • Toxin-Producing Fungi from Fescue Pasture
 S. G. Yates
 In "Microbial Toxins," vol. 7 "Algal and Fungal Toxins,"
 eds. S. J. Ajl, Solomon Kadis, and Alex Ciegler, chap. 6,
 pp. 191-206. New York. 1971

In one occurrence of tall fescue toxicity in Missouri in 1967, 11 of 100 head of cattle showed severe symptoms of fescue foot. Many aspects of this disease suggest that fescue foot in cattle is the direct result of fungal growth on the grass. Samples of grass were taken from the toxic pasture and other pastures nearby. From these grass samples, 200 fungal isolates were tested in mice for toxin production. Almost all the toxin producers were from the genus *Fusarium*.

Fusarium tricinctum NRRL 3249 was isolated from yet another sample of toxic tall fescue. This organism grown on synthetic media produced the following mycotoxins: 4-acetamido-4-hydroxy-2-butenic acid γ -lactone (butenolide), 4 β ,15-diacetoxy-8 α -(3-methylbutyryloxy)-12,13-epoxy-trichothec-9-en-3 α -ol (T-2 toxin), and an unknown toxin.

The toxic and questionably toxic *Fusarium* strains (part of the 200 isolates taken from grass samples of the toxic field and other nearby fields) were recultured and examined. The toxicity to mice of all the *Fusarium* organisms could be accounted for by either the butenolide or the T-2 toxin, or both.

The pure butenolide was administered intramuscularly to a heifer for 90 days. The tip of the tail became necrotic and dropped off. Production of necrosis, one of the clinical signs of fescue foot, supports our hypothesis that fungi are involved in fescue foot toxicity. Intramuscular injection of the T-2 toxin for 65 days to a steer caused death. Post-mortem examination showed clinical signs typical of the hemorrhagic syndrome seen in moldy corn toxicosis.

Additional research necessary to prove the butenolide is the direct cause of fescue foot in cattle is in progress.

- 3046 • Hydrolyzed Starch-Polyacrylonitrile Graft Copolymers:
Effect of Structure on Properties
M. O. Weaver, L. A. Gugliemelli, W. M. Doane, and
C. R. Russell
J. Appl. Polym. Sci. 15(12): 3015-3024. December 1971

Three starch-polyacrylonitrile (S-PAN) graft copolymers containing ratios of S: PAN of 1:1.90, 1:1.16, and 1:0.64 were prepared by graft polymerization of acrylonitrile onto gelatinized starch. A fourth graft, made from granular starch, had an S: PAN ratio of 1:2.16. These grafts were hydrolyzed in potassium hydroxide under various conditions to give a series of products with varying amounts of carboxylic acid and amide groups. Maximum conversion of nitrile to carboxyl was 65%. Aqueous dispersions of the hydrolyzed S-PAN's at pH 7-8.5 were viscous, and in general, their viscosities reflected the amount of PAN add-on, with the highest add-on giving the highest viscosity. Plots of the η/C versus C show that hydrolyzed S-PAN's from gelatinized starch behave as normal polyelectrolytes on dilution to low concentration but that S-PAN from granular starch does not.

- 3047 • Linseed Oil on Concrete: Penetration of Linseed Oil
Compositions Into Sheet- and Liquid Membrane-Cured
Concretes
L. E. Gast, W. L. Kubie, and J. C. Cowan
J. Amer. Oil Chem. Soc. 48(12): 807-810. December 1971

Penetrations of concrete specimens by solutions of boiled linseed oil in mineral spirits and emulsions of boiled linseed oil were measured. Concrete specimens were cured with polyethylene sheet (removable) and wax-based and resin-based compounds before penetration tests. Penetration was greatest at 35 days and least at 4 and 7 days after curing. Penetration at 105 days was only slightly less at 35 days. Maximum penetrations were obtained with solutions more dilute than 50 volume percent of linseed oil in mineral spirits. Penetrations on polyethylene-, wax-, or resin-cured specimens varied from 1.5 to 3 mm when 50 volume percent linseed oil solution or emulsion was spread on the specimen at the rate of 0.16 pound per square yard.

- 3048 • Full-Fat and Defatted Soy Flours for Human Nutrition
 G. C. Mustakas
 J. Amer. Oil Chem. Soc. 48(12): 815-819. December 1971

Full-fat and defatted soy flours represent basic forms of soy protein that can be produced by simple, uncomplicated, and low-cost processes, and properly processed soy flours have excellent nutritional value as demonstrated in biological feeding tests with humans and small animals. New, simple production methods for full-fat soy flours, including an extrusion process for use in urban communities and a simple hand process for use in villages where skilled labor, machines, and steam power are unavailable, have been developed. Severe heat treatment during processing reduces the availability of amino acids, impairs oxidative stability, reduces vitamin content, and develops poor flavor characteristics in the product. Lipoxigenase inactivation before the toasting treatment is important to obtain a stable, high-fat product. Good flavor in soy flours can be achieved to make them acceptable to the consumer as constituents in a wide range of processed foods.

- 3049 • Organoleptic and Oxidative Stability of Blends of Soybean and Peanut Oils
 J. C. Cowan, Helen Moser, G. R. List, and C. D. Evans
 J. Amer. Oil Chem. Soc. 48(12): 835-839. December 1971

A table oil or a salad and cooking oil must serve both as an oil for salad dressings and for cooking potatoes in a deep-fat fryer. Blends of peanut and unhydrogenated soybean oil that had been treated with a metal inactivating agent, such as citric acid, were scored fairly high by a research taste panel after aging for 4 or 8 days at 60° C. Heating samples to frying temperature resulted in significantly higher room odor scores for peanut oil than for the blends. Blends of hydrogenated or hydrogenated-winterized soybean oil with peanut oil were generally scored about equal to peanut oil in room odor tests. Potatoes fried in these oils were generally given comparable and not significantly different scores.

- 3050 • Char-Ashing of Glyceride Oils Preliminary to the Atomic Absorption Determination of Their Copper and Iron Contents
 C. D. Evans, G. R. List, and L. T. Black
 J. Amer. Oil Chem. Soc. 48(12): 840-842. December 1971

Trace amounts of copper and iron were determined by char-ashing samples of molecularly distilled glyceride oil, copper-hydrogenated edible oils, and salad oils with added copper salts and copper-chromite catalysts. Char-ashing, coupled with the atomic absorption method of analysis, gave

excellent reproducibility in a salad oil for copper at 0.025 ± 0.002 p.p.m. and for iron at 0.082 ± 0.012 p.p.m. Agreement was excellent between the char-ashing method and the direct solvent method of analysis when levels of the two trace metals were high enough to be analyzed by direct atomic absorption. Copper in edible oils can be accurately analyzed at levels of less than 10 p.p.b. by the char-ashing technique.

3051 • Crambe Seed Processing: Decomposition of Glucosinolates (Thioglucosides) With Chemical Additives

L. D. Kirk, G. C. Mustakas, E. L. Griffin, Jr., and A. N. Booth¹

(¹Western Regional Research Laboratory, Albany, Calif.)
J. Amer. Oil Chem. Soc. 48(12): 845-850. December 1971

Crambe meal was cooked with a variety of bases and metal salts to study decomposition of the undesirable glucosinolate (thioglucoside), *epi*-progoitrin. Salts of iron and copper were preferred because they were the most active decomposers and because they did not reduce the lysine content as did the alkalies. An unsaturated hydroxy nitrile, representing about 25 mole percent of the decomposed *epi*-progoitrin, was the major reaction product left in the cooked meal. A thionamide product, representing about 7 mole percent of the decomposed *epi*-progoitrin, was also observed in meals cooked with metallic salts. The thionamide was relatively unstable in moist, hot crambe meal, especially at basic pH, and may therefore be an intermediate in a complex decomposition path. Rats fed ferrous sulfate-treated crambe meal as 30% of a protein sufficient diet gained 70% compared with a basal control. Enlargement of thyroid, liver, and kidneys was about 1.5 times that of the control organs. A crambe meal heated under the same conditions but without ferrous sulfate and fed at the same diet level caused 100% mortality within two weeks.

3052 • Structure of Viriditoxin, A Toxic Metabolite of

Aspergillus viridi-nutans

D. Weisleder and E. B. Lillehoj

Tetrahedron Lett. (48): 4705-4706. November 1971

The structure of viriditoxin, a new toxin isolated from *Aspergillus viridi-nutans* NRRL 4365, was determined by nuclear magnetic resonance in conjunction with other spectroscopic methods.

3053 • Scanning Electron Microscope

L. H. Princen and F. L. Baker

Paint Varn. Prod. 61(12): 21-29. December 1971

The scanning electron microscope (SEM) is probably the most important tool to appear in a long time for the study of coatings. The wide range of magnification available, ease of sample preparation, relatively simple operation of the instrument, and easy interpretation of the image make the SEM much more suitable to coatings research than either optical or transmission electron microscopy. Pigments and extenders can be classified as to particle shape and size distribution. These properties have a significant effect on gloss, strength, chemical reactivity, and hiding power of dry films. Vehicle compatibility and wetting of pigments and substrates by the vehicle can also be observed easily. Surface texture and internal structure can be revealed any time during the life of a paint film, as can lack or loss of adhesion to the substrate. The SEM was used to confirm the results of a 4-year outdoor exposure study, which showed that linseed oil emulsion and solvent-base coatings were as good as or superior to exterior latex paints in adhesion, tint retention, mildew, dirt collection, blistering, and cracking.

REPUBLICATION

- 2926 • Integrated Process for Dry-Milling Grain Sorghum
 R. A. Anderson and L. H. Burbridge
 Northwest. Miller 278(7): 24-28. July 1971

This article originally appeared in the Proceedings of the Seventh Biennial Grain Sorghum Research and Utilization Conference, held at Lubbock, Texas, March 2-4, 1971, pp. 65-69.

UNOFFICIAL PUBLICATIONS

Listing of Publications and Patents of the Northern Marketing and Nutrition Research Division would not be complete without including some unofficial publications. These are writings by members of the Northern Division staff, and, although written from previously published official material, are of a public service value from the standpoint of review and updating of the literature.

An Exocellular Polysaccharide from the Diatom *Gomphonema olivaceum*
 Susan A. Huntsman¹ and J. H. Sloneker
 (¹Duke University Marine Biology Laboratory, Beaufort, N.C.)
 J. Phycol. 7: 261-264. 1971

CONTRACT AND GRANT RESEARCH PUBLICATIONS

[Report of research work done by an outside agency under contract with the U.S. Department of Agriculture and supervised by the Northern Marketing and Nutrition Research Division.]

- 237-C* • The Response of Chicks, Ducklings, Goslings, Pheasants and Poults to Graded Levels of Aflatoxins
R. D. Muller, C. W. Carlson, G. Semeniuk, and
G. S. Harshfield
South Dakota State University, Brookings
Poultry Sci. 49(5): 1346-1350. September 1970
- 238-C • Starch Graft Polymers. I. Graft Co- and Terpolymers of Starch with 2-Hydroxy-3-methacryloyloxypropyltrimethylammonium Chloride and Acrylamide: Preparation and Evaluation as Silica Depressants
Duane A. Jones and Wesley A. Jordan
General Mills Chemicals, Inc., Minneapolis, Minn.
J. Appl. Polym. Sci. 15(10): 2461-2469. October 1971

[Report of research done by an outside agency under a grant from the U.S. Department of Agriculture and supervised by the Northern Marketing and Nutrition Research Division.]

- 96-G* • Survival of Lyophilized *Bacillus popilliae* in Soil
A. J. Lingg and K. J. McMahon
Kansas State University, Manhattan
Appl. Microbiol. 17(5): 718-720. May 1969
- 97-G* • Subsite Mapping of Enzymes. Studies on *Bacillus subtilis* Amylase
John A. Thoma, Charles Brothers, and Joseph Spradlin
University of Arkansas, Fayetteville
Biochemistry 9(8): 1768-1775. August 1970

- 98-G* • Quantitative Determination of Water in a Hydrophilic Macromolecular Sample (Dextran) by Gas Chromatography
Wallace M. Pasika and Arthur C. West III
Texas A&M University, College Station
Anal. Chem. 43(2): 275-276. February 1971
- 99-G • Meiosis in *Hansenula holstii* and *H. wingei*
D. A. Stock and S. H. Black
Baylor College of Medicine, Houston, Texas
J. Gen. Microbiol. 64(Pt. 3): 365-372. December 1970
- 100-G* • Structure and Function of Amylases. I. The Subunit Structure of Porcine Pancreatic α -Amylase
John F. Robyt, Carol G. Chittenden, and Catherine T. Lee
Iowa State University, Ames
Arch. Biochem. Biophys. 144(1): 160-167. May 1971
- 101-G • Evidence for a Carbenoid Intermediate in the Corey-Winter Alkene Synthesis
Derek Horton and Charles G. Tindall, Jr.
Ohio State University, Columbus
J. Org. Chem. 35(10): 3558-3559. October 1970
- 102-G • Preparation and Characterization of the 6-Aldehyde Derivatives of Amylose and Whole Starch
D. M. Clode and D. Horton
Ohio State University, Columbus
Carbohydr. Res. 17(2): 365-373. April 1971
- 103-G* • Differentiation and Product Formation in Molds
R. D. Megee III, S. Kinoshita, A. G. Fredrickson, and H. M. Tsuchiya
University of Minnesota, Minneapolis
Biotechnol. Bioeng. 12(5): 771-801. September 1970
- 104-G* • Isolation, Purification, and Characterization of a Maltotetraose-Producing Amylase from *Pseudomonas stutzeri*
John F. Robyt and Rosalie J. Ackerman
Iowa State University, Ames
Arch. Biochem. Biophys. 145(1): 105-114. July 1971

- 105-G • The Cytology of *Hansenula*. II. Germination of Ascospores of *Hansenula holstii*
Jyotirmoy Das and S. H. Black
Baylor College of Medicine, Houston, Texas
Tex. Rep. Biol. Med. 29(2): 163-179. 1971
- 106-G • Air-Oxidation of Starch Using Quinquevalent Vanadium as Catalyst
R. E. Harmon, S. K. Gupta, and J. Johnson
Western Michigan University, Kalamazoo
Staerke 23(4): 125-128. April 1971
- 107-G* • Anisotropic Light Scattering by Asymmetric Starch Granules
Z. Mencik, R. H. Marchessault, and A. Sarko
State University College of Forestry, Syracuse, New York
J. Mol. Biol. 55(2): 193-207. January 1971
- 109-G • Synthesis of the 6-Aldehyde Derivative of Cellulose, and a Mass-Spectrometric Method for Determining Position and Degree of Substitution by Carbonyl Groups in Oxidized Polysaccharides
David M. Clode and Derek Horton
Ohio State University, Columbus
Carbohydr. Res. 19(3): 329-337. October 1971
- 110-G* • Reaction of Protein Disulfide Groups with Ellman's Reagent: A Case Study of the Number of Sulfhydryl and Disulfide Groups in *Aspergillus oryzae* α -Amylase, Papain, and Lysozyme
John F. Robyt, Rosalie J. Ackerman, and Carol G. Chittenden
Iowa State University, Ames
Arch. Biochem. Biophys. 147(1): 262-269. November 1971
- 111-G • The Cytology of *Hansenula*. III. Nuclear Segregation and Envelopment During Ascosporogenesis in *Hansenula wingei*
S. H. Black and C. Gorman
Baylor College of Medicine, Houston, Texas
Arch. Mikrobiol. 79(3): 231-248. November 1971
- 112-G • Oxidation of Starch by Hydrogen Peroxide in the Presence of UV Light. Part I
Robert E. Harmon, S. K. Gupta, and J. Johnson
Western Michigan University, Kalamazoo
Staerke 23(10): 347-349. October 1971

[Report of research work supported with funds provided by the U.S. Department of Agriculture under the authority of U.S. Public Law 480, 83rd Congress, and sponsored by the Northern Marketing and Nutrition Research Division.]

- 335-F • Amylose Content in Starches from Some Unfamiliar Sources of Food
N. Roy and A. K. Mitra
Jadavpur University, Calcutta, India
J. Food Sci. Technol. 7(1): 164. April 1970
- 336-F • Synthesis of Fluoro-Derivatives of the Higher Natural Sterols
R. Ikan and P. Klein
The Hebrew University of Jerusalem, Jerusalem, Israel
Isr. J. Chem. 8(6): 965-969. November-December 1970
- 337-F • Studies on *O*-(2-Hydroxyethyl) Ethers of Carbohydrates: Part II. Hydroxyethylation of Carbohydrates with Ethylene Carbonate
H. C. Srivastava, K. V. Ramalingam, and A. S. Chaudhari
Ahmedabad Textile Industry's Research Association, Ahmedabad, India
Indian J. Chem. 9(10): 1081-1082. October 1971
- 338-F • Studies on *O*-(2-Hydroxyethyl) Ethers of Carbohydrates: Part III. Synthesis of 2-*O*-(2-Hydroxyethyl)-D-glucose
H. C. Srivastava, K. V. Ramalingam, and A. S. Chaudhari
Ahmedabad Textile Industry's Research Association, Ahmedabad, India
Indian J. Chem. 9(10): 1083-1084. October 1971

July-December 1971

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PATENTS

[These patents are assigned to the Secretary of Agriculture. Copies of patents may be purchased (50 cents each) from the Commissioner of Patents, U.S. Patent Office, Washington, D.C. 20231. Order by number, do not send stamps.]

Novel Cysteine Derivative

Mendel Friedman and James F. Cavins

U.S. Patent 3,607,072. September 21, 1971

S- β -(4-pyridylethyl)-L-cysteine, a novel amino acid produced by reacting L-cysteine and 4-vinylpyridine in the presence of triethylamine, is ninhydrin-positive and very highly resistant to acid hydrolysis. It is particularly useful as an internal standard for chromatographic analyses of basic amino acids.

Pressure-Sensitive Adhesive Tape Comprising Gluten Hydrolysate Derivatives

Catherine Aranyi, Kurt Gutfreund, Ervin J. Hawrylewicz,
and Joseph S. Wall

U.S. Patent 3,607,370. September 21, 1971

A pressure-sensitive adhesive tape comprising a backing with a pressure-sensitive coating comprising epoxy derivatives of the large peptide fraction of partially hydrolyzed gluten polymerized with various acrylic compounds.

Preferential Enzymatic Lysis of Vegetative Cells in Presence of Sporulated Bacterial Cells

George R. Hrubant and Robert A. Rhodes

U.S. Patent 3,616,250. October 26, 1971

A novel extracellular enzyme complex precipitated from cultures of *Bacillus* NRRL B-3425 at critical concentrations selectively destroys the vegetative but not the sporulated cells of *Bacillus popilliae* or other spore-forming bacteria, thus providing a means for isolating laboratory-grown *B. popilliae* spores required for studying the apparently limited infectivity of the spores produced *in vitro* as compared with spores from diseased Japanese beetle larvae.

Production of Mevalonic Acid by *Endomycopsis fibuliger*

Kei Arima and Gakuzo Tamura

U.S. Patent 3,617,447. November 2, 1971

Four- to five-day fermentations of the unrestrictedly available yeast *Endomycopsis fibuliger* NRRL Y-7069 (cataloged by the Institute of Applied Microbiology, Tokyo, as IAM-4347) provides the production of about 1,000 micrograms of mevalonic acid per milliliter of fermented medium.

LICENSING OF PATENTS

Many inventions and discoveries of the Northern Division are covered by patents assigned to the Secretary of Agriculture.

Assigned patents are available for use by business and industry under either exclusive or non-exclusive licenses. Conditions

applicable to the granting of licenses are set forth in the Federal Register, May 14, 1970 [35(94): 7493-7495]. Further information can be obtained from the Administrator, Agricultural Research Service, U.S. Department of Agriculture, Washington, D.C. 20250.

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